ASBESTOS POLICY AND PROCEDURE MANUAL

Guidelines for Management and Maintenance Personnel

MASSACHUSETTS DIVISION OF OCCUPATIONAL HYGIENE

Asbestos Program

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Asbestos Policy and Procedure Manual

Guidelines for Management and Maintenance Personnel

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INTRODUCTION

Background

Much information has been generated in recent years about the health hazards of asbestos. Asbestos is the common name given to a group of naturally occurring hydrated mineral silicates that separate into fibers when milled. The physical and chemical characteristics of asbestos have made it exceptionally useful for a variety of purposes including fireproofing, thermal insulation, acoustical control, moisture control and decoration. The use of asbestos-containing materials by the construction industry increased dramatically in the early 1940's and continued until controls were promulgated by the U.S. Environmental Protection Agency in 1973 and 1978. These controls represented the government's acknowledgment of the serious health risks posed by asbestos in buildings. Many facilities owned by the Commonwealth were built before 1973 during that time when asbestos use was routine. Its presence demands the implementation of asbestos control programs to minimize the potential for exposure of building occupants to airborne asbestos fibers.

Purpose of the Manual

This manual was developed to provide a framework of information about asbestos and its control for managers and employees responsible for and working in buildings that contain asbestos materials owned by the Commonwealth. It is a component of the Commonwealth's comprehensive asbestos control plan which was developed to ensure that:

- serious asbestos conditions are recognized and corrected;
- asbestos conditions are continually monitored and do not worsen; and
- asbestos-containing materials are handled properly during maintenance, abatement and disposal.

Use of the Manual

This manual contains information that can be useful to management maintenance, custodial, and other personnel occupying buildings which contain asbestos. It includes the following:

- Reference Information on the health effects of asbestos, government regulations applicable to asbestos, agency contacts, air sampling, protective equipment, and other pertinent subjects.

- Guidance for Management to assist in establishing facility specific asbestos control programs.

- Safe Work Practices to provide step-by-step procedures for maintenance and custodial personnel who may have contact with asbestos as a result of their job duties.

The manual can be used effectively by management and maintenance personnel as follows:

Management Personnel:

1. Read and become familiar with all sections of the Manual.

2. Work with the Division of Occupational Hygiene (DOH) to use the manual as the basis for a facility asbestos control program. Adapt the ideas presented to the needs of your facility. Establish additional procedures as necessary with assistance from DOH.

3. Incorporate all information regarding asbestos in the facility into the manual in the appropriate sections. This includes:

   - The locations and conditions of asbestos;

   - Facility-specific emergency procedures, building monitoring and asbestos waste disposal; and

   - Management and employee responsibilities for the implementation and enforcement of the facility asbestos control program.

4. Use the reference materials in the manual to address employee questions as appropriate. Call the Division of Occupational Hygiene at (617) 969-7177 if you are unable to answer an employee question.

Maintenance and Custodial Personnel

1. Read and become familiar with the reference and safe work practices sections.

2. Be aware at all times of the location and condition of asbestos materials in the facility.

3. Use the safe work practice sections as guidelines for work which might disturb asbestos-containing material.

4. Become familiar with facility-specific procedures for emergencies, building monitoring and asbestos waste disposal.

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Appendices
(Section 25)

Asbestos Management Program

The goal of the management program is to minimize exposure of building occupants to asbestos fibers. The nature of an asbestos management program will depend on various factors including the amount, condition, and location of the asbestos-containing material and types of contact building occupants may have with the material. The presence of friable asbestos material in a building may not in itself constitute a health hazard. The hazard arises when asbestos is disturbed and fibers become airborne. The airborne asbestos fibers then enter the respiratory system. Therefore, the presence of asbestos demands a management program to minimize the potential for the disturbance of asbestos materials. To establish an asbestos management program, the following tasks must be completed.

A. Identify Asbestos Materials.

1. Review documents pinpointing the location and condition of asbestos-containing materials. If no such documents exist, contact the Division of Occupational Hygiene (DOH) at 617-969-7177 to request an asbestos survey at your facility. See Section 23, "Agency Addresses / Phone Numbers", for the address.

2. Incorporate the information regarding the location of asbestos into the building plans for your facility. Update this information as necessary.

3. Incorporate the documents into this manual in Section 4. Update the information in Section 4 as necessary.

B. Identify All Potential Contact with Asbestos by Occupants.

1. Determine nature and frequency of occupant contact with the asbestos.

   Building maintenance procedures may contribute to intermittent release of asbestos fibers during repair, replacement or modification of building facilities. Examples of activities which may lead to fiber release include work on heating and ventilation equipment, lighting fixtures, telephones, power lines, ceilings, floors and roofs. It includes any activity in which a worker comes in contact with asbestos material or any work where vibrations may release fibers.

   Other building occupants may participate in activities which contribute to inadvertent disturbance of asbestos materials. This includes personnel working in office space and clients occupying living quarters.

2. Keep records of the above information and update as necessary to aid in decisions regarding the identification and implementation of appropriate training programs and abatement measures.

C. Identify and Comply with Applicable Government Regulations

1. Consult Section 10 and Appendix B to become familiar with the regulations relevant to your facility operations. Obtain further information as necessary from the appropriate agency. See Section 23 for agency listings.

2. Assess facility operations and ensure compliance with applicable regulations at all times.

D. Establish Educational and Safety Programs for Occupants.

The nature of these programs must be based on the information generated in step B.

1. Provide employees with access to the information included on the Material Safety Data Sheet (MSDS) for asbestos as established by the Massachusetts "Right-to-Know" Law. See Appendix A for the MSDS on asbestos.

2. Provide appropriate training for all maintenance and custodial personnel who come in contact with asbestos-containing material. Note: State employees can work with less than 3 linear or square feet of asbestos upon completion of training by DOH. State employees working with asbestos in amounts equal to or greater than 3 linear or square feet must be provided with an asbestos protection program that meets the requirements of the EPA (Environmental Protection Agency) Worker Protection Regulation. Please note that DOH training is not designed to meet the requirements for abatement work under the EPA Regulation. See Section 10 for state policy and Appendix B for EPA Regulations.

   A program for maintenance and custodial personnel working with less than 3 linear or square feet of asbestos should include:

   a. Training in safe work practices through hands-on sessions.

   b. Provision of protective equipment appropriate for the tasks personnel might be performing around asbestos.

   c. Provision of medical screening appropriate to the type of respiratory equipment personnel will be using. See Appendix C for ANSI (American National Standard Institute) guidelines and/or call the Division of Occupational Hygiene 617-969-7177 for guidance.

   d. Implementation and enforcement of safe work practices through a management program:

      - Monitor activities involving contact with asbestos by maintenance and custodial personnel;

      - Maintain records of training;

      - Ensure the availability of financial and staff resources necessary for implementation and enforcement of safe work practices.

SEE RELEVANT SECTIONS IN THIS MANUAL FOR SPECIFIC PROCEDURES FOR GUIDANCE IN:

- Safe Work Practices

- Protective Equipment

3. Notify other building occupants if they work in areas where asbestos is present or if their job routine will be interrupted by an asbestos abatement project. In this latter case, occupants should be notified in advance of the project. Provide employees with the opportunity to have their questions and concerns addressed.

   See also, G. "Provide Oversight of Contractors."

E. Establish a Building Monitoring Program.

The conditions of the asbestos in buildings must be monitored to effectively record and respond to any changes.

1. Establish a written monitoring system with a checklist of the locations of asbestos-containing materials. Check the asbestos materials in the building for damage or potential damage causing situations, i.e. water leaks which may have an adverse affect on the material or changes in the use of a room where asbestos is present.

2. Establish a system that ensures review of damaged asbestos materials by the asbestos program coordinator before patching or repairing begins.

3. Report any changes in the conditions of the asbestos at your facility to the Division of Occupational Hygiene, 617-969-7177.

F. Establish Procedures for Handling Asbestos Waste.

The handling of asbestos-containing waste must be accomplished in compliance with safe work practices and government regulations. The person responsible for implementing these procedures will depend upon who generates the waste. Asbestos-containing waste will be generated at state facilities from either:

1. Asbestos abatement projects conducted by an asbestos abatement contractor:

   a. Ensure that the contractor follows all applicable EPA and DEQE regulations. See Appendix B for DEQE (Department of Environmental Quality and Engineering) and EPA regulations.

   b. Obtain an invoice from the owner of the disposal facility to ensure that waste arrived.

   c. Maintain records.

2. Or incidental jobs involving less than 3 linear or square feet of asbestos material conducted by properly trained state employees (For exceptions, see Section 10, State Policy). Establish an in-house procedure for asbestos waste:

   a. Identify a safe and secure place for temporary storage.

   b. Identify a dependable transporter.

   c. Identify an approved disposal facility.

   d. Maintain records including a log of all activities resulting from the handling of asbestos waste and all invoices for transport and disposal of asbestos waste.

See also, Section 21, Safe Work Practices in Handling Asbestos Waste.

G. Establish Emergency Procedures.

1. Identify and communicate procedures to be followed by personnel in the case of an emergency involving asbestos. These procedures should be applicable at all times the facility is occupied.

2. Identify personnel responsible for making decisions regarding the isolation of areas of the building and the use of protective equipment in areas where asbestos may be posing an immediate hazard.

3. Consider the need for hiring a contractor on retainer to respond to asbestos emergencies.

See Section 17 on Emergency Procedures.

H. Provide Oversight of Outside Contractors.

Two types of contractors may have contact with asbestos in your facility:

1. Asbestos abatement contractors.

   Ensure that contractors are following applicable EPA/DEQE regulations. See Section 10 and Appendix B for regulations.

2. Other contractors working in areas where asbestos is present.

   a. Have these contractors check in with a central person who has full knowledge of the location of asbestos in the building.

   b. Ensure that the workers do not disturb asbestos material in a manner that will endanger the health and safety of the building occupants or the outside contractor.

I. Identify Personnel Responsibilities

Identify personnel assigned to the various aspects of the facility asbestos management program. Insert the information into this section. Include the following:

1. Overall Asbestos Program Coordination

2. Coordination of Training and Notification

3. Implementation and Enforcement of Safe Work Practices

4. Implementation of Emergency Procedures

5. Temporary Storage, Transport and Disposal of Asbestos Waste

6. Equipment Purchase and Maintenance

7. Building Monitoring

8. Central Record Keeping

9. Financial Oversight

10. Contractor Oversight

Insert DOH asbestos reports and other asbestos related reports in this section. Reports should include locations of all asbestos containing material in the facility.

ASBESTOS RELATED DISEASES

Many questions have been asked about how asbestos affects our health. The following paragraphs address those questions most commonly asked. However, not all questions can be answered as many still remain unresolved medically and scientifically. Continued research in this field is required.

General Questions and Answers

I) What diseases are related with asbestos exposure?

Four disease states have been linked with occupational exposure to asbestos. The majority of this information has come from studies of individuals who worked with asbestos material in the earlier part of this century. The disease states are:

a) asbestosis
b) lung cancer
c) mesothelioma
d) gastrointestinal cancers

a) Asbestosis - is the scarring of lung tissues which occurs during and after asbestos fiber exposure. The lung cells react against the inhaled asbestos fibers producing the scarring. This emphysema-like condition produces symptoms that include coughing, shortness of breath and a tightness or pain in the chest. The breakdown of the lung tissue eventually makes it impossible for the body to take in enough oxygen. Causes of death include heart failure, respiratory infections or the later development of lung cancer.

b) Lung cancer (Bronchogenic carcinoma) - is a malignant, invasive growth or tumor occurring in the lungs. Generally, lung cancer is a complication of a person with asbestosis who also smokes. Asbestos workers with a family history of lung cancer are also more likely to acquire the disease. Symptoms include a cough or change in cough habit and chest pain.

c) Mesothelioma - is a malignant tumor that spreads rapidly throughout the cells of membranes covering the lungs and body organs. Common symptoms of mesothelioma include shortness of breath, pain in the chest wall, weight loss and cough. No successful treatment is yet known for this disease. Death usually occurs within one year after the disease has been diagnosed.

d) Gastrointestinal Cancers have been linked to the ingestion of asbestos material. The average rates for developing digestive system cancers are increased among asbestos workers. Some of these cancers include cancer of the esophagus, stomach, colon and pancreas. Ingestion of asbestos can occur by swallowing asbestos contaminated food and beverages or inhaling airborne asbestos fibers that subsequently adhere to the upper respiratory tract and are swallowed.

II. What is the risk of developing these diseases?

Several factors determine an individual's risk for the development of these diseases. Some of these factors include the individual's occupation, smoking habits, level of exposure, etc.

In general, the higher the levels and the longer the duration of exposure to airborne asbestos fibers, the greater the risk of developing asbestosis, lung cancer, mesothelioma or gastrointestinal cancers.

Further information on who is at risk of developing an asbestos related disease and the factors involved in the risk is provided on page 5-8.

III. When do asbestos-related diseases appear?

Once exposed to airborne asbestos, signs and symptoms of the diseases don't appear till 10 to 40 years after the initial exposure. This delayed onset of disease is known as a latency period. Lung cancer and mesothelioma have a latency period of approximately 30 to 40 years, although both of these diseases have appeared as early as 15 years after the first exposures. Asbestosis usually has a latency period of 15 to 30 years. However, the greater the exposure to airborne asbestos, the shorter the latency period for asbestosis.

IV. How much asbestos exposure is hazardous?

This question has no clear-cut answer. As stated before, in the case of asbestosis and lung cancer, the risk increases with increasing amount of exposure. However, some studies and evidence have shown that even brief low-level exposure to airborne asbestos fibers has produced mesothelioma. Therefore, the best protection against the hazard is to avoid unnecessary exposure or contact with asbestos material or fibers.

The following pages provide more detailed information on the health issues of asbestos exposure. A Material Safety Data Sheet summarizing the health hazards, handling, disposal, and description of asbestos can be found in Appendix A.

THE RESPIRATORY SYSTEM

To understand asbestos-related diseases, one must understand the organs and body systems asbestos affects.

The main function of your lungs is to bring oxygen into your body and expel carbon dioxide that you have produced. As you inhale air into your lungs, it passes through the nasal and/or oral cavities (refer to figure 5-1). The air that you inhale contains a vast amount of dust and debris. Hair present in the nasal cavity filters out large particles from the air to prevent their entry into the lung. The air and smaller particles of dust and debris continue the journey through the pharynx, trachea, and then into the two bronchial tube branches (see figure 5-1). Each bronchial tube continues to "branch-out," much as a tree would. The branches become smaller and smaller, finally terminating in air sacs. These air sacs, or alveolar sacs, are the area in which the gas exchange takes place. Oxygen is picked up by the blood and carbon dioxide is left to be expelled.

The lungs contain several protective mechanisms to get rid of the smaller particles that have proceeded past the nasal cavity. One such mechanism is the cough. The bronchi and trachea are so sensitive that any foreign matter that rests on these areas produces an irritation which results in a cough. The rapidly moving air usually carries with it any debris or particles that are present in the bronchi or trachea.

A second mechanism involves the cells lining the inside of the trachea and lungs. The cells contain small hairs, the cilia, as well as being coated with mucous. See figure 5-2. The cilia beat toward the pharynx, moving the mucous as a continually flowing sheet. Particles that implant on the trachea or lungs and do not cause irritation are moved in this mucous sheet back to the pharynx and swallowed into the stomach or expelled.

The last protection aid the lungs have for the smaller particles that reach the deep lung (which include the bronchioles and alveoli) is the body's own immune system. Large, mobile cells known as macrophages are activated when the dust particles implant in the deep lung. The cells engulf the particles and digest them, using strong acids or enzymes.

As can be seen from Figure 5-1, the lungs are located inside a chest cavity known as the pleural cavity. Each lung is wrapped in a membrane consisting of mesothelial cells. This membrane also lines the chest cavity, peritoneal cavity and diaphragm. Without these linings in your body, breathing would be impossible.

Figure 5-1. The Human Respiratory System

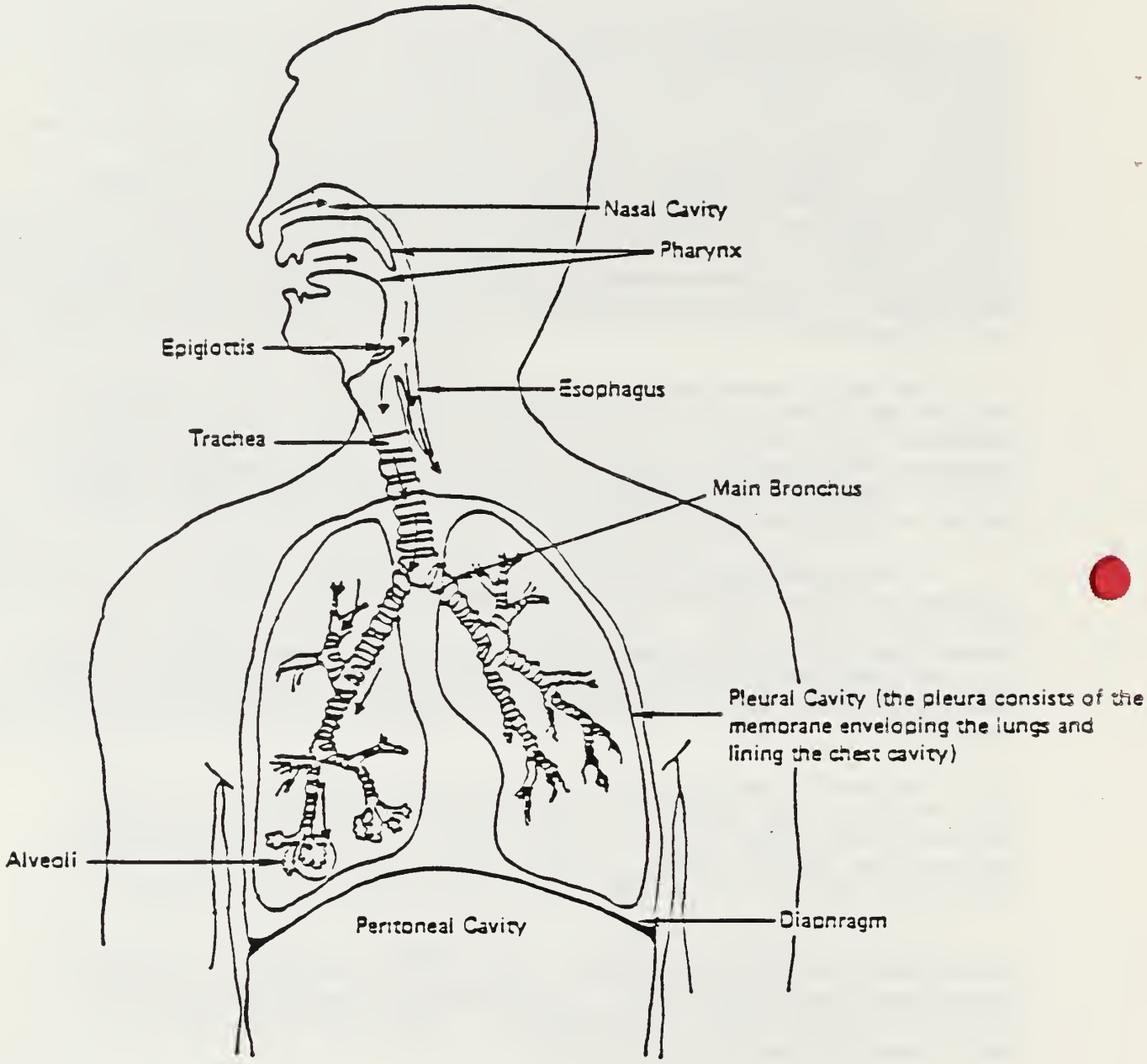
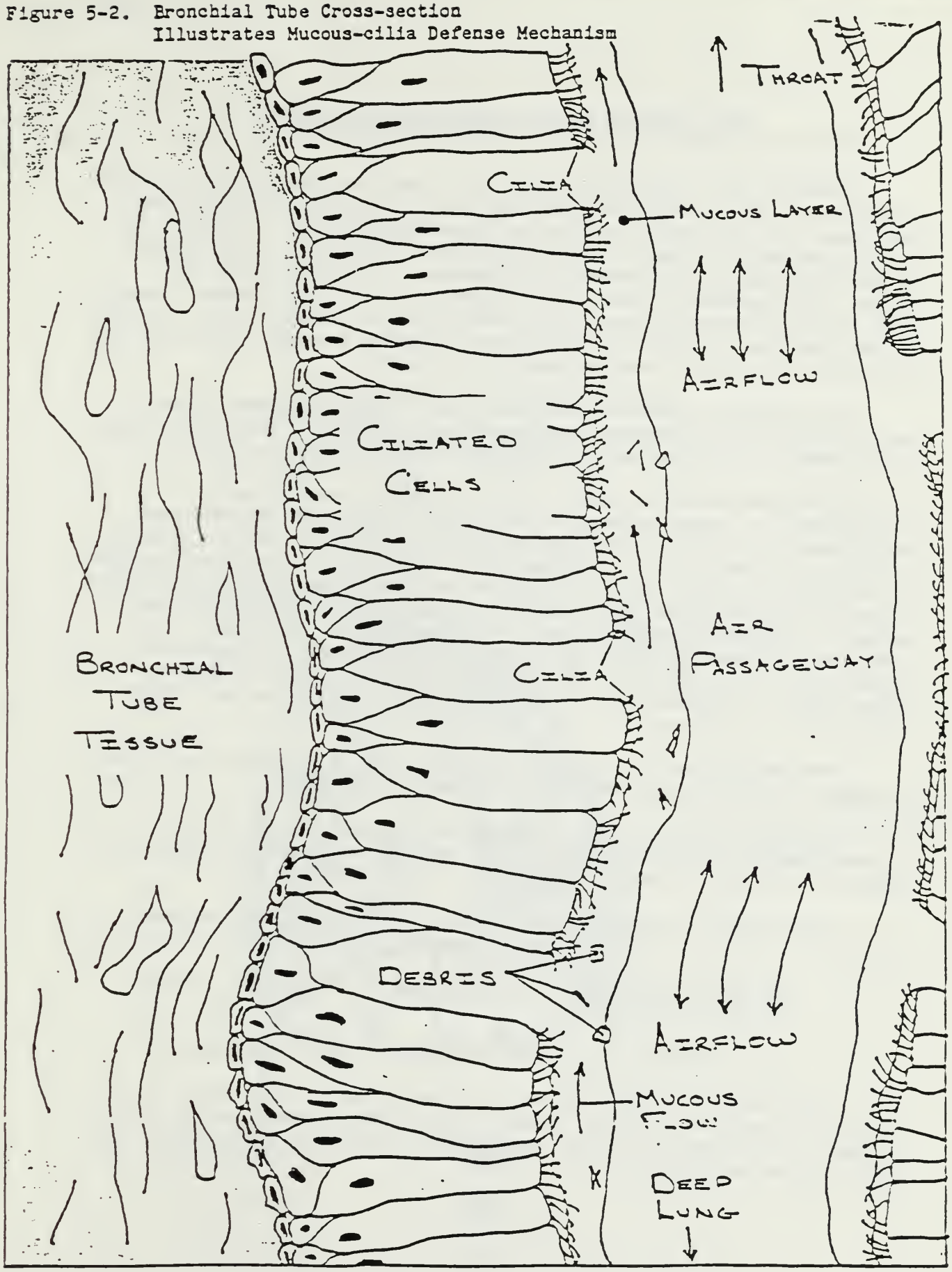


Figure 5-2. Bronchial Tube Cross-section
Illustrates Mucous-cilia Defense Mechanism



HOW ASBESTOS AFFECTS THE RESPIRATORY SYSTEM

Asbestos that escapes the nasal hair, cough and mucous/cilia defense mechanisms reach the deep parts of the lung. Once deposited there the body sends out macrophages to destroy the asbestos fibers. However, the macrophages are not always able to engulf and digest the inhaled fibers. If the macrophage is unsuccessful, it deposits a coating around the fibers. This process results in the scarring of the lung tissue. Scarred lung tissue prevents the passage of gases between the blood and the lungs. As more asbestos is inhaled the extent of scarring becomes greater and the ability of the lung to breathe normally decreases.

The scarring process is long and slow. Health problems do not usually appear until 15 years after the first exposure. When the disease does appear, it is diagnosed as asbestosis (refer to Figure 5-3).

These same asbestos fibers can also produce mesothelioma. Mesothelioma is a rare disease in the general population but is common among asbestos workers. Approximately 7-10% of asbestos workers exposed to asbestos fibers will die of this cancer. The tumors can develop either on the pleural (chest) cavity linings or the peritoneal (abdominal) cavity linings. The cancer may grow outward through the chest wall or it can spread into the bones, lymph glands and areas between the lungs. The abdominal and chest cavities can become filled with cancerous masses. Organs can be crushed or cut off from the rest of the body (refer to Figure 5-3). As stated previously, death occurs within one year after diagnosis of the disease.

Mesothelioma has the longest latency period of all asbestos-related diseases. The cancer can take 30 to 40 years to develop.

Lung cancer is caused by many agents, the most common being cigarette smoke. Toxic agents, such as asbestos or cigarette smoke, can produce a malignant growth or tumor in the lung tissue.

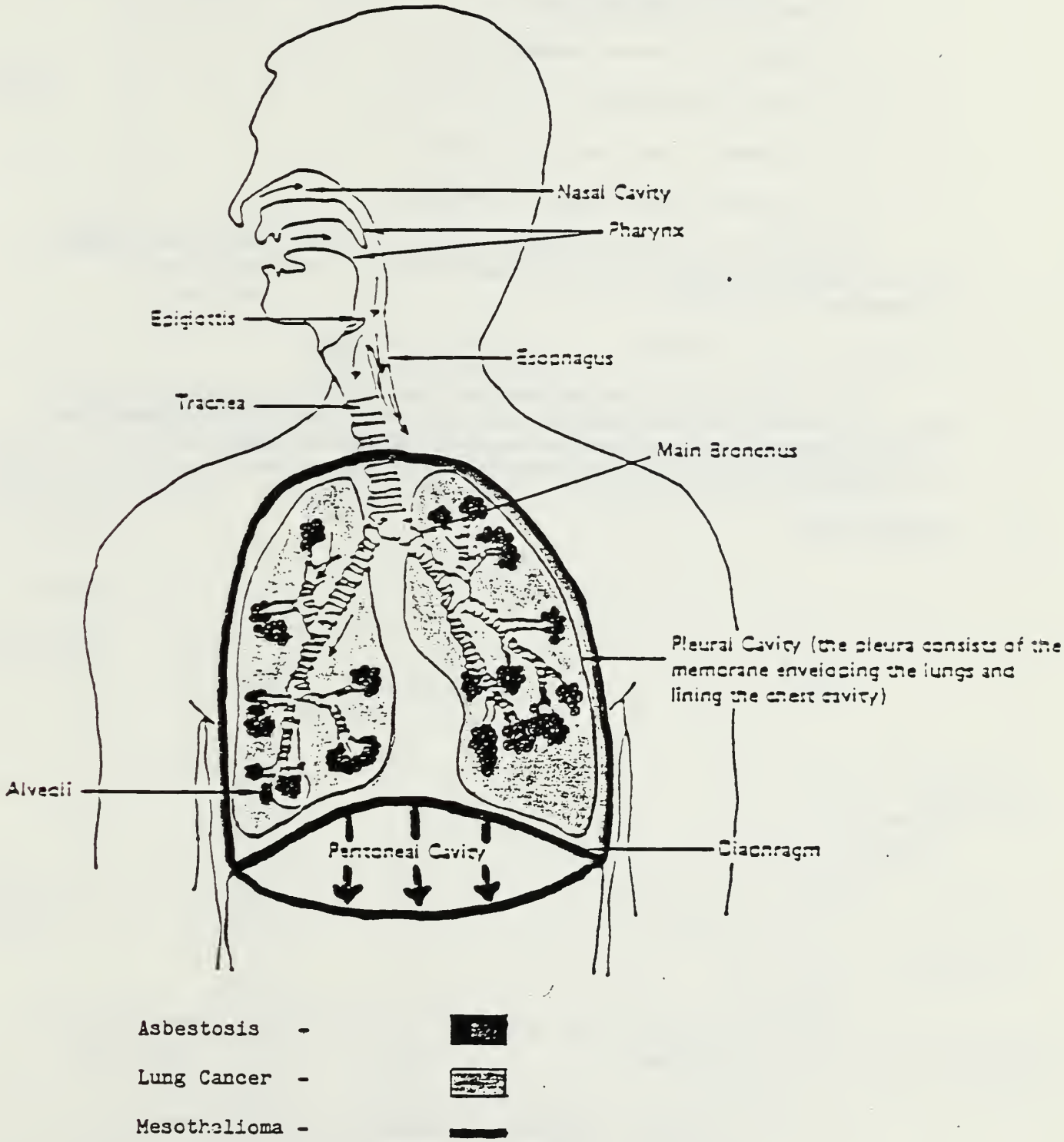
Lung cancer is the most common cancer found in asbestos workers. The risk of developing lung cancer increases if:

1. An individual smokes cigarettes and is exposed to airborne asbestos fibers; or

2. And individual is exposed to asbestos fibers continually.

The disease can appear as early as 10-14 years after the first exposure to airborne asbestos, however, the normal latency period is 30 to 35 years. Approximately 15% of the patients with asbestosis develop lung cancer (refer to Figure 5-3).

Figure 5-3. Areas of the Respiratory System Affected by Asbestos Exposure



WHO IS AT RISK OF DEVELOPING ASBESTOS RELATED DISEASES

Several factors are important in assessing an individual's risk to the development of these diseases:

1. The amount of asbestos fibers you are exposed to and how long you are exposed to them.

2. Whether the person smokes or not.

3. Fiber type and size.

4. The body's reaction to the fiber.

5. Age when first exposed to asbestos.

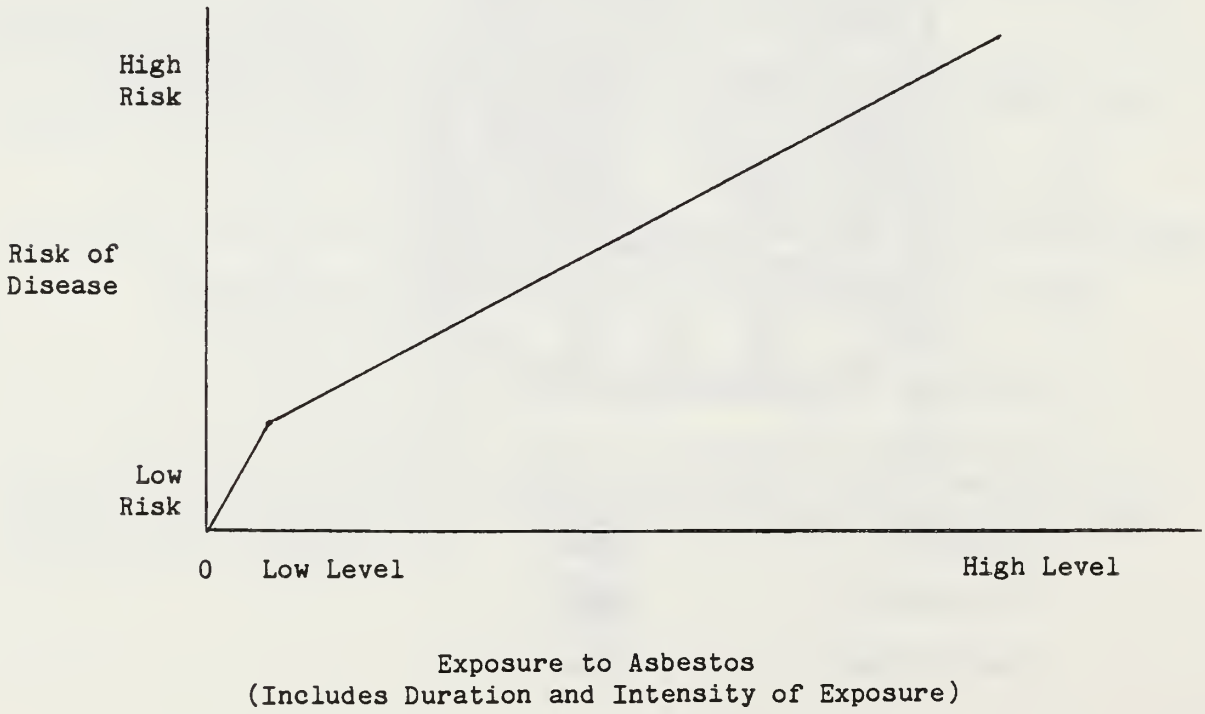
To simplify the rather complex subject of risk, graphs will be used to illustrate the risk of acquiring each disease under different circumstances.

I. Asbestos Fiber Exposure

The following four graphs show the dose response relationship which medical studies have shown exists when examining the effects of asbestos on human health. As the level of exposure increases there is a corresponding increase in the risk of disease development.

Mesothelioma

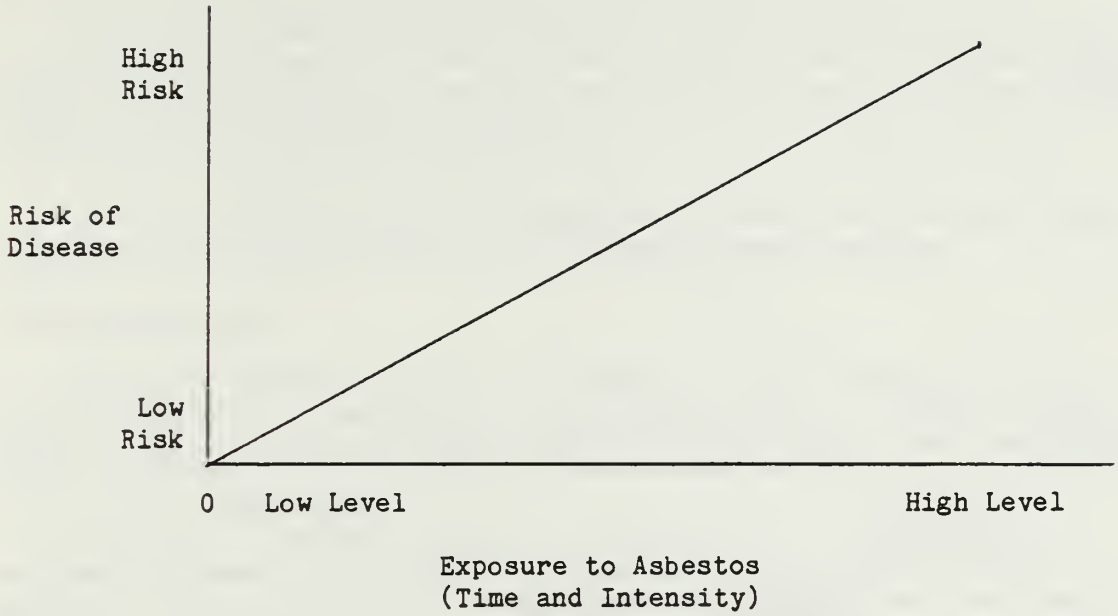
Graph 5-1



The above graph also shows that even at low exposure levels there is an increased risk to develop mesothelioma.

Asbestosis

Graph 5-2



This graph demonstrates the dose response relationship between exposure to asbestos and risk of developing asbestosis. The more one is exposed to asbestos fibers (quantity and duration) the greater the risk of developing asbestosis. Several studies have shown that the risk increases for smokers.

II. Smoking

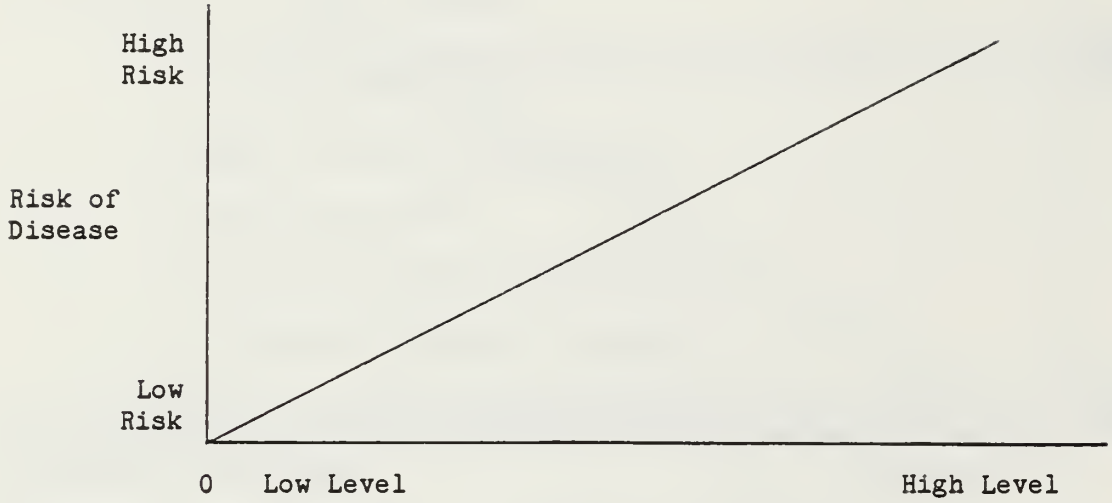
Lung Cancer

Graph 5-3

Ref. - Adapted from "Workplace exposure to asbestos", NIOSH/DHHS publication no. 81-103, November 1980.

Lung Cancer

Graph 5-4



Exposure to Asbestos
(Time and Intensity)

Bar Graph 5-3 demonstrates that there is a significantly increased risk to the development of lung cancer when one smokes and is exposed to asbestos fibers vs. being a non-smoker with exposure to asbestos. Why is there such an increase in risk of acquiring lung cancer if one smokes? One reason may be that smoking inhibits the cilia located in the trachea and lung (refer to page 5-5, figure 5-2) which normally sweep some portion of the asbestos fibers upwards, removing it from the lung. This allows more asbestos particles to reach the deep lung, thereby increasing one's risk.

It is interesting to note that cigarette smoking alone puts one more at risk for developing lung cancer than exposure to asbestos alone.

III. Asbestos Fiber Type and Size

Asbestos fiber type and size also seem to play roles in determining the risk of developing asbestos related diseases.

Asbestos Fiber Type

There are six fibrous asbestos minerals. They include:

1. Chrysotile
2. Amosite (fibrous cummingtonite-grunerite)
3. Crocidolite
4. Tremolite
5. Actinolite
6. Anthophyllite

Approximately 90 to 95% of all the asbestos used in commercial and construction products was chrysotile. Amosite and crocidolite were used to a lesser extent mainly in preformed boiler or pipe casings. Tremolite was usually found as a contaminant in talc or vermiculite products.

Chrysotile, amosite, and crocidolite have all been found to produce asbestosis, lung cancer and mesothelioma. Proper conclusions about the toxicity of an individual fiber type can not be drawn. One reason for this is that the majority of exposures to asbestos involve materials containing several different fiber types.

Attempts to link each of the asbestos diseases with certain fiber types have resulted in conflicting and inconsistent results.

Asbestos Fiber Size

Research studies examining the asbestos fiber's size have been fairly successful in confirming which fibers produce a greater cancer risk. The longer, thinner fibers seem to be more toxic than the short and thick fibers.

Therefore, a particular fiber's potential for causing disease presumably depends on its shape. The amphibole fibers (crocidolite, amosite and tremolite), which are straight and needle-like, are thought to enter the lung more easily and in greater quantity than the chrysotile fiber, which is bent and coiled. As explained previously, the greater the exposure to airborne asbestos, the greater the risk of acquiring disease. In this case, the amphiboles would produce a greater exposure, therefore a greater risk.

IV. Age at exposure

The age at which you are first exposed also has a bearing on your risk of developing an asbestos-related disease. Because of the latency period of 15-40 years, a young child or adolescent has a greater chance of developing an asbestos disease in his or her lifetime. Note that asbestos is not more toxic to the young child or adolescent, it just has more time to develop into a disease before an individual dies.

V. Individual susceptibility

Another factor to consider in looking at the risks from asbestos exposure involves your body's reaction to asbestos fibers. Why do some people, after working with asbestos material for many years at high exposure levels, acquire an asbestos-related disease while other members of the same group develop a different asbestos disease, or none at all? Unfortunately the question can't be answered with our present scientific knowledge.

Occupations, past and present, with potentially high exposures to asbestos fibers include shipyard workers, asbestos textile workers, asbestos removal workers, automotive workers (brake lining and clutch maintenance), asbestos product manufacturers, demolition and construction workers, asbestos insulation applicators and asbestos mining and milling employees. Individuals employed in any of the above occupations have a high risk for developing an asbestos-related disease.

Intermediate to low-level exposure to airborne asbestos fibers can occur in the following occupations; secretaries and management employed in asbestos mills or manufacturing plants, individuals living in the immediate area of the mills and plants, electricians, plumbers, carpenters, families of workers who are employed in a high asbestos exposure occupation, and maintenance personnel. This is only a partial listing. The number and variety of people that could be potentially exposed to intermediate and low-levels of asbestos dust is enormous.

In summary, several factors aid in predicting the risk for acquiring an asbestos-related disease. The amount of asbestos fibers exposed to and for how long, history of smoking, fiber type and size, age at which first exposure occurred and the body's reaction to asbestos play important roles in determining whether an asbestos-related disease will develop.

If you still have any questions that remain unanswered, do not hesistate to contact the Division of Occupational Hygiene Asbestos Program at 969-7177.

Heat Stress

Employees involved in asbestos abatement work are potentially exposed to excessively hot environments (ie - crawl spaces, boiler rooms). This section is included for general information. If workers will be exposed to excessively hot environments, a more extensive program should be established prior to starting the work. In general, the more strenuous the job, the greater the chance of heat disorders occurring. The degree of heat stress present is a function of many factors including environmental conditions such as air temperature, air movement and relative humidity, as well as the worker's age, sex, physical condition, degree of obesity, degree of acclimatization (i.e. - workers returning from vacation are less acclimated and thus more susceptible) and type of clothing worn.

The ill effects of heat on the human body have been known for centuries. Under normal conditions, the body produces more heat than necessary to maintain the body temperature. Excess heat is given off from the body by conduction, convection and radiation from the skin when the temperature of the surrounding air and objects is lower than the body temperature. Excess heat can also be released through evaporation of sweat if the skin is exposed to the air to allow evaporation to occur. However, this process also is dependent on the surrounding temperature and the moisture in the air. When the humidity increases, the rate of evaporation decreases. Air currents will hasten heat loss unless the air temperature is above the body temperature and the humidity is high which case they will have the reverse effect. A small amount of heat is also lost by exhalation. If the body is unable to lose sufficient heat by the above methods, then the body temperature will, of course, rise and may lead to the various forms of heat sickness listed below.

HARMFUL EFFECTS Three fairly distinct effects may result from exposure to high temperature. Note that productivity also generally decreases significantly with increased heat.

1. <u>Heat cramps</u> are probably due to a low sodium chloride level in the blood. The worker experiences severe painful muscular contractions of the arms, legs, hands and trunk. They are always preceded by marked sweating. The temperature may be above or below normal with a rapid pulse. Cramps are usually in the extremities and generally follow heavy exertion. If heat cramps occur the worker should rest in a cool place and increase salt intake by drinking ample salt solution. (See #5 - "Preventive Measures", page 6.2)

2. <u>Heat exhaustion</u> usually results from dehydration. The individual becomes pale, has cold, clammy skin and is weak to the point of exhaustion. He/she may also have a headache, vomiting, nausea, muscle cramps, diarrhea and giddiness. The blood pressure is low, and the temperature may be above or below normal. The condition resembles surgical shock. It may be preceded or followed by heat cramps. There is no increase in body core temperature. If heat exhaustion occurs the worker should rest in a cool area and drink ample salt solution (i.e. 1 pint - See #5 - "Preventive Measures", p. 6-2).

3. Heat stroke (sunstroke) is the most serious disorder, resulting from the body's inability to cope with excessive heat. The skin becomes hot and dry (or red, mottled) and there is a rapidly rising body temperature with a rapid pulse and deep respiration. Blood pressure is high, and there may be unconsciousness, convulsions or deep coma. The onset may be gradual, with mental excitement and dryness of mouth and skin, or may be sudden with delirium, stupor or coma. This condition has a death rate of 30% to 50%. Seek medical help immediately!

Preventive Measures

1. Avoid entering hot areas whenever possible.

2. Attempt to enclose or ventilate equipment or processes generating heat or steam. For example, reflective shielding placed between workers and the source of radiant heat (ie - furnace) can reduce workers' exposure to heat.

3. Use local exhaust ventilation to draw heat from the area. Fans can be useful also but they are not recommended when loose asbestos material is present because fibers will become airborne.

4. Implement short work periods and long rest periods (in a cool area). It may be necessary to have up to 75% rest time depending on work conditions.

5. Drink ample water with adequate salt replacement. Salt tablets must be taken with sufficient volumes of water to prevent gastric irritation. Workers should drink either a commercial thirst quenching electrolytic solution or a solution of 1 tablespoon of table salt dissolved in 15 quarts of water. (Workers with heart conditions or on low salt diets should consult with a physician first.) Note - In the course of a day's work a worker may sweat up to three gallons of fluid in which vital substances are dissolved. Replacement of this fluid and electrolytes (i.e. sodium and chloride) must be equal to the amount lost. Thirst is not necessarily a good indicator and workers should drink more than is necessary to quench thirst. (ie - drink fluids approximately every 15 - 20 minutes.) Avoid alcohol consumption which can lead to further dehydration.

6. Slowly acclimate workers to the hot environment. Acclimatization is the process through which humans are able to adjust to hot environments by means of physiological and psychological adjustments. Gradual exposure to a hot environment over a one to two week period is best. Acclimatization can be quickly lost. New employees or workers returning after a weekend or vacation will be less able to tolerate heat than those working regularly in a hot environment and will thus be more susceptible to heat stress.

Treatment / Emergency Measures

1. Remove victim to cool area. (Remove worker's respirator if he / she is wearing one.)

2. Soak clothes thoroughly with water (or remove clothes) and fan person vigorously to increase cooling. If body temperature is above 103°F. (39.5° C.) give ice water baths until temperature is below 103°F.

3. Refer to specific treatments under "Harmful Effects" pp 6-1, 6-2.

4. Seek Medical help immediately.

PRODUCTS AND MATERIALS CONTAINING ASBESTOS

Asbestos has been used in a wide range of products since as early as the 1900's to as late as present day. Materials and products containing asbestos are divided into two categories:

(1) Friable material and asbestos textile products

(2) Non-friable matrix-bonded composite products

Friable materials are those which can be crumbled, pulverized, or reduced to powder using hand pressure. These materials are considered a greater potential health hazard due to their ready release of asbestos fibers with minimal mechanical disturbance.

Non-Friable products contain a bonding agent (e.g. cement, plastics, asphalt, glue) which locks the asbestos fibers into the product. Fiber release from the product is therefore less likely to occur. This also means that the potential health hazard from a non-friable material is less than a friable material. However, never rule out a non-friable product as a health hazard. Its hazard depends on how you use the product, what the environmental conditions are (is the area ventilated?, is the area wet?), and the physical alteration of the product. (Are you sanding, drilling, breaking,...etc. the product?). Refer to Section 20 for more information on non-friable materials.

If you have any questions regarding whether a friable or non-friable asbestos material is a health hazard, please contact the Division of Occupational Hygiene at 969-7177.

The use of asbestos in some of the products listed in Table 7-1 has subsequently been banned by the U.S. Environmental Protection Agency (EPA) and the Consumer Products Safety Commission (CPSC). Other products are no longer manufactured.

Spray-applied asbestos coatings were banned for fireproofing/insulating in 1973 and for decorative purposes in 1978. The installation of wet-applied and pre-formed asbestos insulation was banned in 1975. In 1977 the use of asbestos in artificial logs for gas-burning fireplace systems was banned. The use of asbestos in spackle and joint compounds was also banned in 1978. To find out whether the product you use contains asbestos call the manufacturer, the Division of Occupational Hygiene Asbestos Program (969-7177) or the Consumer Products Safety Commission (CPSC). The CPSC's phone number is 1-800-638-2772.

The following table includes information on products that may contain asbestos.

TABLE 7-1 - ASBESTOS CONTAINING PRODUCTS

PRODUCT	WHERE FOUND	USE
I) Friable Materials and Products		
a) Asbestos Cord	Electrical Installations and Equipment	Electrical Element Insulation
b) Asbestos Tape, Strip and Tubing	Electrical Installations and Pipe Joints	Electrical Conductor Insulation High Temperature Pipe Joint Insulation Wrap
c) Fire Resistant Theater and Welding Curtains, Protective Clothing	Auditoriums, Stages Metal Shops, High Temperature Occupations	Fire & Heat Barrier
d) Spray Applied or Trowelled-on Insulation	Steel I-Beams and Decks, Concrete Ceilings and, Walls, Hot Water Tanks, Pipe Elbows, Boiler Casing	Thermal & Acoustical Insulation, Decorative Coverings
e) Preformed Thermal Insulation	Boilers, Pipes, Hot Water Tanks	Thermal Insulation Condensation Control
f) Artificial Snow	General Commercial Use	Decoration
g) Artificial Fireplace Logs for Gas-Burning Fireplaces	General Commercial Use	Decoration
h) Corrugated Asbestos Paper	Hot Water, Steam Pipes	Thermal Insulation
II) Non-friable Materials and Products		
a) Acoustic Plaster	Corridors, Lunchrooms, Offices, Auditoriums, Music Rooms, Sound Control and Projection Rooms	Acoustic Insulation
b) Asbestos Cement Products		
Transite-asbestos Panels	On Walls, Ceilings	Acoustical Purposes, Reinforcing Material
Storm Drainage Pipes	Drainage Systems	Reinforcing Material For Drain Pipe
Asbestos Stucco	Walls and Ceilings	Decorative Covering

TABLE 7-1 - ASBESTOS CONTAINING PRODUCTS (cont.)

PRODUCT	WHERE FOUND	USE
Asbestos Siding Shingles	Usually on Exterior Walls	Decoration, Insulation and Protection of Building Structure
Roofing Shingles	Usually on Exterior Roof	Decoration, Insulation and Protection of Building Structure
Laboratory Table Tops	Laboratories	Heat & Chemical Resistance
Electrical Conduits Clapboard	Electrical Installations Wood Frame Buildings Under Siding Material	Insulating Material Construction Material
Asbestos Ebony Products	Electrical Panels & Circuitry	Insulating Material
c) Floor and Ceiling Tiles	----------	Decorative, or Insulating Material
d) Clutch Facings, Drum Brake Linings, Disc Brake Pads and Brake Blocks	Automobiles, Railroad Cars & Airplanes	Thermal Insulation, Reinforcing Material
e) Filtration Materials	Manufacturing & Food Processing Plants	Filters
f) Roofing Felts	Roofs of Buildings	Waterproofing and Weatherproofing
g) Roofing Asphalt	Roofs of Buildings	Waterproofing and Weatherproofing
h) Quality Vinyl Wallcoverings	----------	Decorative Material
i) Gaskets	Varies	Heat Resistant Material
j) Millboard, Rollboard	Walls & Ceilings	Construction Material
k) Pipeline Wrap	Underground oil and Gas Pipes	Corrosive Protection

TABLE 7-1 - ASBESTOS CONTAINING PRODUCTS (cont.)

PRODUCT	WHERE FOUND	USE
l) Asbestos Insulation Board	Walls, Ceilings, Ducts, or Pipe Enclosures	Thermal and Fire-proofing Barrier
m) Miscellaneous Asbestos	Containing Compounds	
Putties, Caulks, Paints, Sealants, Patching Tape Compounds, Tile Cement, Grout, Plaster, Oil/Gas Drilling Fluids	All Construction Occupations and Exploratory Drilling Occupations	Construction Materials and Lubricating Fluid
n) Shotgun Shell Base Wads	----------	Thermal Insulation

SUSPECT MATERIALS SAMPLE COLLECTION

The Division of Occupational Hygiene does not recommend cutting into a well wrapped pipe or boiler covering solely for the purpose of sample collection since this creates an unnecessary exposure risk. If the material has to be removed or cut into for another reason, a sample should be sent in to D.O.H. for analysis. Suspect material is assumed to be asbestos until analyzed.

SAMPLE CONTAINER AND LABELING

1. Clear plastic bags or sealable containers (i.e. - film canisters) should be clearly labelled in pen with:

    1. Date
    2. Building
    3. Agency
    4. Sample location
    5. Type of covering (i.e. - pipe covering, boiler covering, spray-on)

    Note that plastic bags should be labelled prior to sampling in case the pen makes a hole in the bag.

HOW TO COLLECT A BULK SAMPLE

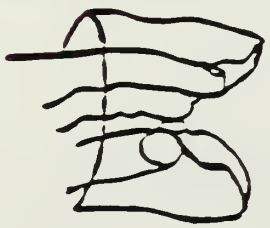
1. Only those persons needed for sampling should be in the area.

2. A NIOSH/MSHA approved respirator should be worn. (i.e. - reusable half-face respirator)

3. The material should be sprayed with a <u>light</u> mist of water from a spray bottle to minimize fiber release during sampling.

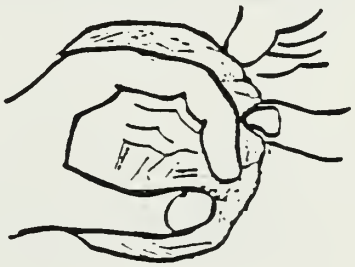
4. If a sealable container is used, hold the container as far as possible from the face and obtain a sample by penetrating the material with the container using a twisting motion.

5. If a bag is used, turn the bag inside out over your hand. Using the bag like a glove, grab a piece of material. Still holding the material, invert the bag over your hand so that the material is inside the bag.



1. Invert labelled bag over hand

2. Using bag like a glove, pick up a piece of material



3. Invert bag back over hand so material is inside

4. Seal bag with masking tape

6. The sample container must be well sealed with masking tape.

7. Clean up any debris created during sampling according to "Asbestos Debris Cleanup Procedures". (See Section 16.)

Important Considerations when Sampling

1. The sample should be approximately the size of a quarter.

2. Samples should be collected from damaged or exposed areas so as not to create further damage to the material.

3. A core sample must be taken since there may be different materials in each layer. (i.e. - penetrate and sample all layers of the material)

4. Three samples should be taken from three different areas for any spray-on material since the material is often not sprayed on evenly and one sample may not be representative of the material.

AIR SAMPLING FOR ASBESTOS

Although it is useful for evaluation of asbestos removals, at this time air sampling plays a limited role in determining the risk from asbestos materials in a building. This is because there are shortcomings in the current air sampling technique.

Air sampling has been one approach proposed to assess the rate of fiber release from asbestos-containing materials. At best, this approach provides information only on current asbestos contamination and no information about the potential for fiber release and future air levels. Moreover, air monitoring for asbestos suffers from substantial problems of a technical and economic nature which limit its use even for assessing current levels of contamination.

The P & CAM 239 methods and 7400 (Phase Contrast Microscopy) used by D.O.H. and most other labs counts total fibers. The method does not tell whether or not the fibers counted are asbestos. Since airborne fibers in buildings are likely to be mixed with fibers from carpets, clothing, hair, books and many other sources, results of a phase contrast microscopy analysis could be highly misleading. For example, an elevated fiber level could be found in a building which has no asbestos or a low fiber level could be attained in a building with highly friable material. Perhaps the best estimate of exposure can be made by visually inspecting the condition, accessibility and friability of the asbestos as well as the potential for airborne fibers in the air plenum.

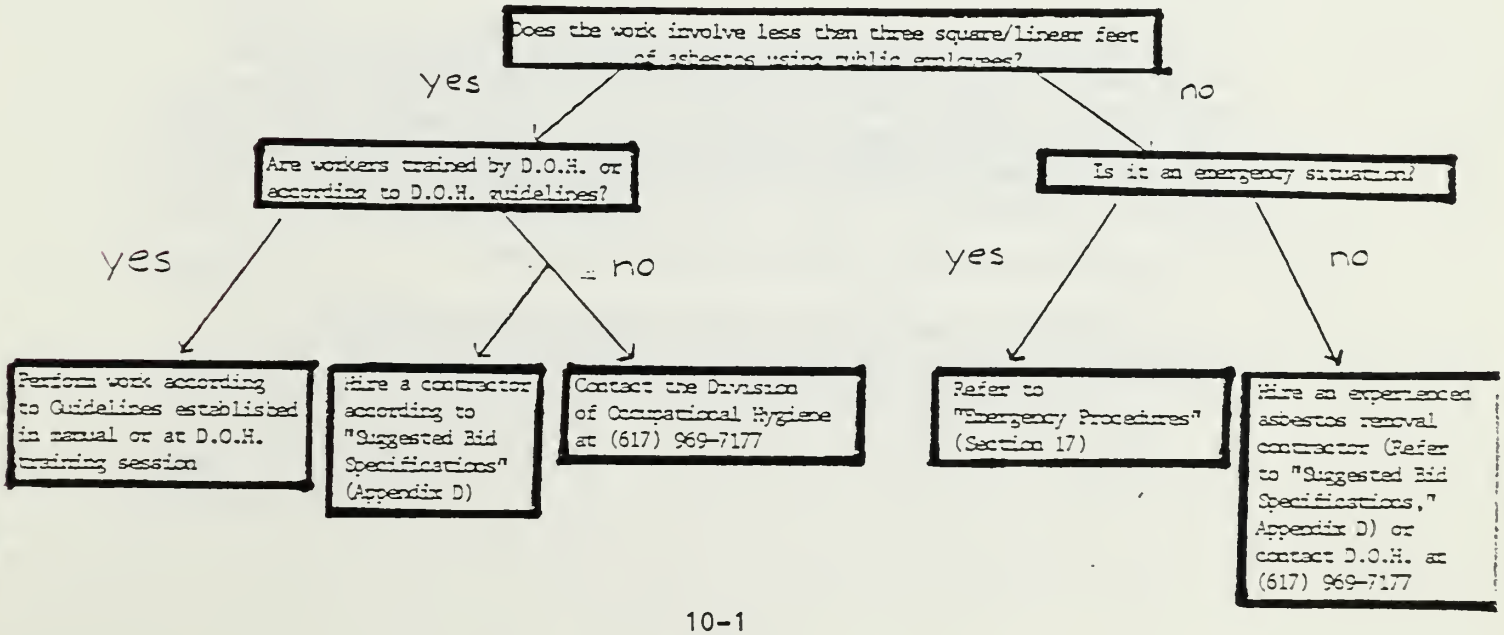
Other laboratory methods measure both small and large fibers and distinguish asbestos from non-asbestos materials. Those methods count fibers by electron microscopy, and confirm that the fibers are asbestos with chemical and crystallographic analyses. The analytical transmission electron microscope (TEM) is the most sensitive and asbestos-specific instrument. EPA has used TEM in experiments to establish baseline asbestos levels indoors and outdoors. However, obtaining enough samples to estimate prevalent airborne levels is difficult in occupied buildings. In addition, TEM analysis is very expensive and few laboratories are qualified to perform it. These limitations, combined with the inability to provide information on future conditions, restrict air samplings usefulness for assessing exposure risk to building occupants. The EPA and DOH do not recommend it as a primary assessment tool except in determining the completeness of large scale abatement projects such as removals.

State Policy

On May 16, 1986, Paul Eustace - Secretary, Executive Office of Labor and Frank Keefe - Secretary, Executive Office of Administration and Finance sent a memorandum to Cabinet Secretaries and Agency Heads clarifying the Commonwealth's policy regarding State employees doing asbestos abatement projects. The basic points of the letter are summarized below. A copy of the letter can be found on pages 10-2 and 10-3.

1. Asbestos abatement work involving more than three linear/square feet or more of asbestos material should not be performed by state employees. The only exception to this policy is employees who have been provided with an asbestos protection program that meets the requirements of the EPA Worker Protection Regulation. (Refer to pages 10-4 through 10-7 and Appendix B for details.) This training manual and the Division of Occupational Hygiene's training program are not designed for this purpose.

2. Asbestos abatement work involving less than three linear/square feet of asbestos material may be performed by state employees only after they are trained by the Division of Occupational Hygiene (i.e., hands-on training sessions for glovebag removal). All asbestos work must be performed according to the guidelines established in this manual. Exceptions must be approved by the DOH.



FRANK T. KEEFE
SECRETARY

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE FOR
ADMINISTRATION AND FINANCE
STATE HOUSE, BOSTON 02133

MEMORANDUM

To: Cabinet Secretaries and Agency Heads

From: Frank T. Keefe, Secretary
Executive Office for Administration and Finance

Paul J. Eustace, Secretary
Executive Office of Labor

Date: May 16, 1986

Re: EPA "Worker Protection" Regulation

****

Last July, Secretary of Labor Paul J. Eustace sent a letter to all Cabinet Secretaries concerning proposed U.S. Environmental Protection Agency (EPA) regulations for Asbestos Abatement Projects. The letter directed all public employees to refrain from undertaking any asbestos abatement work.

Permanent regulations were issued by the EPA on April 25, 1986. A copy is enclosed for your information. These regulations will become effective on June 9, 1986. The purpose of these rules is to protect state and local government employees from the potential hazards of asbestos abatement work.

The principal difference between the proposed and final form of the regulations is an exemption allowing for the routine repair of a three square foot or three linear foot area. In other words, amounts that are less than three square feet or three linear feet would not be regulated under the EPA rules. However, state and local regulations would still apply to all employees. At this time, we would like to:

- Outline the nature of the final regulation; and

- Clarify the Commonwealth's policy regarding state employees involvement with asbestos-containing materials.

EPA Worker Protection Regulation

The final EPA Worker Protection Regulation establishes standards similar to the Occupational Safety and Health Administration's regulations for asbestos abatement work. Included are safe work practices, protective equipment, health monitoring, and record keeping requirements applicable to public employees involved in asbestos abatement projects. According to the regulation:

> "Asbestos abatement project" means any activity involving the removal, enclosure, or encapsulation of friable asbestos material, except removal, enclosure, or encapsulation during sampling or routine repair of less than either 3 linear feet or 3 square feet of friable asbestos material.

State Employees and Asbestos Material

Based on the EPA Regulation, state employees' contact with asbestos will fall into one of two categories: (1) asbestos material in amounts equal to or greater than 3 linear/square feet and (2) asbestos material in amounts less than 3 linear/square feet. The Commonwealth's policy regarding these two categories is as follows:

1. Asbestos material in amounts equal to or greater than 3 linear/square feet. Employees should not participate in asbestos projects that involve this amount of asbestos material. The only exception to this policy will be employees who are provided with an abatement training and health monitoring program. Programs intended to meet these requirements must be approved by the EPA and the MA Division of Occupational Hygiene (DOH).

2. Asbestos material in amounts less than 3 linear/square feet. Employees may work with asbestos in these small amounts only after they receive training in safe work practices from the Division of Occupational Hygiene. This type of work may involve minor repairs of asbestos material and incidental contact with asbestos as it arises from other job duties. Exceptions to this policy must be approved by the DOH.

The DOH will initiate training sessions during the next 8 months at approximately 100 facilities. In addition, DOH will provide training on a regular basis in the future. This training is not designed to meet the requirements for asbestos abatement projects as defined in the EPA Regulation. Rather, it will teach employees how to work safely in buildings where asbestos is present.

Conclusion

You are responsible for disseminating this information to all facilities within your jurisdiction. Any questions that you may have can be directed to Frank Kramarz, Project Engineer, at the Division of Occupational Hygiene at 727-3982. If any labor relations issues arise, please call the appropriate assistant director at the Office of Employee Relations, 727-5403.

WORKER PROTECTION RULE

Environmental Protection Agency

The following is an outline of the E.P.A. asbestos safety regulations protecting State and local public employees from the potential hazards inherent in asbestos abatement projects. Prior to this ruling, public employees were not provided with regulatory protection since public employees are generally excluded from coverage under the Occupational Safety and Health Act. The following is a summary of the general requirements of the regulation. The actual regulation, found in Appendix B, should be consulted prior to undertaking an asbestos abatement project using public employees. For further information concerning the final ruling, contact the EPA Region I office at (617) 565-3273.

I. APPLICABILITY OF THE REGULATION

State and local public employees involved in asbestos abatement projects involving 3 square/linear feet or more of asbestos including:

1. Removal
2. Enclosure
3. Encapsulation

NOTE - THE GENERAL STATE POLICY IS THAT NO PUBLIC EMPLOYEE SHOULD DO ANY ASBESTOS ABATEMENT WORK WHICH TRIGGERS COMPLIANCE WITH THIS REGULATION (REFER TO STATE POLICY PAGE 10-1. Asbestos abatement work involving over three square/linear feet of asbestos should be performed by an asbestos abatement contractor according to the "Suggested Bid Specifications" found in Appendix D.

II. WORK PRACTICES

Asbestos must be wet before being handled, cut, scored or removed to prevent emission of airborne fibers.

III. RESPIRATORY PROTECTION

A. Selection of Respirator

Type "C" respiratory protection must be used initially on asbestos abatement jobs since exposure is assumed to be high until air sampling can prove lower exposure. If air sampling proves that exposure levels are lower, the following guideline is used for selecting appropriate respirators. Note that the respirator selected may provide a higher degree of protection than the exposure level (i.e. - A type "C" respirator can be used even if exposure level is low).

1. Half-Face Air Purifying Respirators - When 8 hour time weighted average proves exposure is no more than 10 times the current OSHA permissible exposure limit (PEL)*
2. Full-Face Air Purifying Respirator - When 8-hour time weighted average proves exposure is no more than 50 times the current OSHA permissible exposure limit (PEL)*
3. Powered Air Purifying Respirators - When 8 hour time weighted average proves exposure is no more than 100 times the current OSHA permissible exposure limit (PEL)*
4. Type "C" Supplied Air Respirators - When 8 hour time weighted average exposure is over 100 times the current OSHA permissible exposure limit (PEL)*

* Permissible exposure limit (PEL) is currently 0.2 fibers/cc of air. For example, the 8-hour time weighted average can be no more than 10 times 0.2 f/cc or 2 f/cc to wear a half-face air purifying respirator, etc.

B. Establishing a Respirator Program

A respirator program must be established in accordance to the American National Standards Institute (ANSI) Z88.2 1980. (Copy may be obtained from ANSI, 1430 Broadway, New York City, NY 10018.) No employee shall be assigned to a task requiring a respirator if he/she is determined by a physician to be physically unable to wear a respirator, or if the health or safety of the employee or other employees is impaired by the use of a respirator.

C. Air Sampling

Air samples must be collected on a membrane filter and analyzed by phase contrast microscopy. Personal and environmental samples must be taken in accordance to the regulations.

IV. BASIC CLOTHING/CHANGE ROOMS

Special clothing including whole body coverings, head coverings, gloves and booties must be provided if the exposure level is greater than the current permissible exposure limit (PEL)*. Alternatively work clothes may be specially laundered under the conditions specified in the regulation. Change rooms and lockers must be made available.

V. CAUTION SIGNS AND LABELS

Caution signs must be displayed at each location where airborne concentrations of asbestos fibers may be in excess of the current permissible exposure limit (PEL)*. Contaminated materials and containers must be labelled. All signs and labels must be posted according to specifications set forth in the regulation.

VI. HOUSEKEEPING

External surfaces must be kept free of asbestos fibers according to guidelines set in the regulation.

* Permissible exposure limit (PEL) is currently 0.2 fibers/cc of air.

VII. WASTE DISPOSAL

Debris and asbestos contaminated objects must be sealed in impermeable bags. Refer to Section 21 on Waste Disposal.

VIII. RECORD KEEPING

Personal and environmental monitoring records must be maintained for at least 30 years. Different government agencies as well as the employees must have access to these records. Employees exposed over the current permissible exposure limit (PEL)* must be notified no later than 5 days of the finding.

IX. MEDICAL MONITORING

The employer shall provide or make available at his cost, medical examinations to workers exposed to asbestos initially within 30 days of employment, annually and within 30 days of employment termination. Medical records must be maintained for 30 years. Different government agencies and the employees must have access to these records. Details are provided in the regulation found in Appendix B.

X. REPORTING

Employers must file a report with the Regional Asbestos Coordinator at the EPA Region I at least 10 days before beginning an asbestos abatement job. See "Notification Requirements" found in Section 11.

XI. ENFORCEMENT

Failure to comply with this regulation could result in up to a $25,000 fine per violation.

* Permissible exposure limit (PEL) is currently 0.2 fibers/cc of air.

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAPS)

Asbestos Regulations (40 CFR 61, Subpart M)

U.S. Environmental Protection Agency

The NESHAPS standard is applicable to the removal or shipping of friable asbestos material during demolition and/or renovation operations. Asbestos must be removed from a facility or facility component, in accordance with the standard, prior to demolition. The NESHAPS standard requires asbestos to be wetted prior to removal and to be kept wet until collected for disposal in accordance with the standard. It sets a standard of "no visible emissions" of asbestos and establishes notification and disposal requirements. Compliance with the standard is the equal responsibility of owners and operators of demolition and renovation projects. The sections most applicable to public employees and buildings are summarized below. This summary is not intended to provide the reader with all the necessary details of the standard thus the actual regulation should be referred to prior to any asbestos abatement work. The regulation can be found in Appendix B.

I. DEFINITIONS

A. "Adequately Wetted" means sufficiently mixed or coated with water or an aqueous solution to prevent dust emissions.

B. "Friable asbestos material" means any material containing more than one percent asbestos by weight that hand pressure can crumble, pulverize or reduce to powder when dry. This includes but is not limited to corrugated paper and packed powder asbestos pipe coverings.

C. "Demolition" means the wrecking or taking down of any load-supporting structural member of a facility together with any related handling operations.

D. "Remove" means to take out friable asbestos material from any facility.

E. "Renovation" means altering in any way one or more facility components including pipe coverings, ducts, etc. Operations in which load-supporting structural members are wrecked or taken out are covered under C (above).

F. "Strip" means to take off friable asbestos materials from any part of a facility.

G. "Visible emissions" means any emissions containing particulate asbestos material that are visually detectable without the aid of instruments. This does not include condensed, uncombined water vapor.

H. "Administrator" refers to the Director of Air Management Division, EPA, with attention to the NESHAP Asbestos Coordinator.

II. Demolition and Renovation Requirements

The requirements of this section are dependent on the amount of asbestos material involved. Note - all facilities must estimate the amount of asbestos expected to be removed over a one year period due to non-scheduled or emergency operations and follow these same requirements. (Different requirements apply if the facility is being demolished under order of a State or local governmental agency issued because the facility is structurally unsound and in danger of imminent collapse).

Case 1 Amount of friable asbestos material in a facility being demolished or renovated is at least 80 linear meters (260 linear feet) on pipes or at least 15 square meters (160 square feet) on other facility components.

(A) Notification Requirements

Provide the Administrator with written notice of intention to demolish at least 10 days before demolition and as early as possible before renovation. The notification must include:

1. Name and address of owner or operator
2. Description of facility including size, age, prior facility use
3. Amount of friable asbestos material in the facility
4. Location of facility
5. Starting and completion dates of demolition or renovation
6. Nature of demolition or renovation (ie - pipe covering, boiler insulation, spray-on) and methods to be used (ie - glovebag, polyethylene, etc.)
7. Procedures to be used to comply with regulations (i.e., wet methods, local exhaust ventilation, bagging)
8. Name and location of waste disposal site where asbestos waste will be deposited

Note - suggested notification form is located on page 11-4.

(B) Procedures for Emission Control

Friable asbestos material must be removed from the facility being demolished or renovated prior to wrecking or dismantling which would break up the material or preclude access to the material for subsequent removal.

* The asbestos material must be adequately wetted prior to removal or stripping.
* If material cannot be wet because unavoidable equipment damage would result, the owner/operator must request permission from the Administrator and use a local exhaust ventilation and capture system as defined in the regulations. Permission must be obtained prior to the start of the work.
* Asbestos materials must be carefully lowered to the ground not thrown.
* Material must be kept wet until collected for disposal.
* No visible emissions to the outside air are allowed.
* The material must be collected and disposed of at waste sites operated as specified in sections 61.152 and 61.156.

Case #2 Amount of friable asbestos material in a facility being demolished is less than 80 linear meters (260 linear feet) on pipes and less than 15 square meters (160 square feet) on other facility components. (Do not have to notify the EPA if renovation involving this amount of material).

(A) Notification Requirements

Provide the Administrator with written notice of intention at least 20 days before demolition is to start. The notification must include:

1) Name and address of owner or operator
2) Description of the facility being demolished or renovated including size, age, prior facility use
3) Amount of friable asbestos material in the facility
4) Location of facility being demolished or renovated
5) Scheduled starting and completion dates of demolition or renovation

Note - These regulations apply to the EPA only. The DEQE requires a 20-day notification on every asbestos abatement project regardless of the amount of material being removed.

NOTIFICATION REQUIREMENTS FOR ASBESTOS ABATEMENT

I. EPA (Environmental Protection Agency)

A. NESHAPS Requirement - whenever asbestos is being removed

1. Demolition - 10 days notice if greater than 260 linear feet or 160 square feet
   - 20 days notice if less than 260 linear feet or 160 square feet

2. Renovation - As soon as possible before work begins if greater than 260 linear feet or 160 square feet
   - No notification requirement if less than 260 linear feet or 160 square feet

3. Information Required on NESHAPS notification (Suggested form on page 11-4.
   - Name and address of owner or operator
   - Size, age, prior use, location of facility
   - Amount of friable material in facility
   - Scheduled start and completion dates of project
   - Procedures used to comply with NESHAPS Standard (i.e. - wet methods)
   - Waste disposal site to be used.

B. TSCA Requirement - Whenever public employees are doing any type of asbestos abatement project involving more than 3 square or 3 linear feet of asbestos including removal, encapsulation or enclosure.

1. If a NESHAPS notification is filed, it is not necessary to notify under TSCA - provided that the NESHAPS notice includes the fact that public employees will be doing abatement work.

2. Information Required on TSCA notification

- Postmarked 10 days before project begins
- Employers name and address
- Location, street address of facility where abatement project is scheduled
- Start and completion dates

II. DEQE (Department of Environmental Quality Engineering)

1. Information Required for all asbestos removal projects. Contact Regional DEQE Office. See Section 23 for addresses and telephone numbers.

- Notify 20 days prior to asbestos removal
- Name, address, location of facility
- How much asbestos is to be removed
- Start and completion dates
- Who is removing the asbestos
- Work practices used to minimize hazards and to comply with NESHAPS
- Where the asbestos will be disposed.

III. DOH (Division of Occupational Hygiene)

1. Information Required

- Notify at least 10 days in advance for all asbestos abatement projects including removal, enclosure and encapsulation
- Name, address, location of facility
- Contact person and telephone number
- Details of the abatement project (i.e. - removal vs. encapsulation)
- Who is performing the abatement project

- How much asbestos material is being removed, enclosed or encapsulated
- Scheduled start and completion date
- Work practices being used to decrease exposure including type of respirators to be worn by workers.

DEMOLITION/RENOVATION NOTIFICATION INFORMATION SHEET

(as required in Title 40 CFR Part 61, Subpart M, §61.146
of the NESHAP Asbestos Standard)

Name of Operator/Owner: _____

Address of Operator/Owner: _____

_____

_____

_____ Phone: _____

Description of Facility: Size: _____ Age _____

Prior Use: _____

Amount of Friable Asbestos Present: _____ (ft. or sq. ft.)

Amount of Friable Asbestos to be Removed: _____ (ft. or sq. ft.)

Address of Facility: _____

_____

Starting Date of Removal: _____ Completion Date: _____

Nature of Demolition/Renovation Method Used: _____

Procedures Used for Compliance with Subpart M: _____

_____

Name/Location of Waste Disposal Site: _____

_____

_____

Name/Title/Authority of Agency Ordering Demolition: _____
(for projects described in §61.145(c))

_____

_____

RESPIRATORY PROTECTION

The type of respirator worn for an asbestos abatement job depends upon the level of exposure (i.e. - fibers/cc) as well as on the individual. A medical examination may be necessary to determine if an individual can wear a particular respirator. Medical conditions such as severe heart disease, emphysema, asthma or other lung disorders may make it difficult for an individual to wear a particular type of respirator. Check with your physician if you have any questions on whether or not you can safely wear a respirator. Note - Your facility may have established a medical screening program for this purpose.

There are three major categories of respirators used for asbestos abatement work.

1) Air Purifying Respirators

2) Air Supplied Respirators

3) Self Contained Respirators

A description of the three types of respirators including when they are typically used follows.

1. AIR PURIFYING RESPIRATORS

Air purifying respirators remove limited concentrations of contaminants from the breathing air, but do nothing to increase or change the oxygen content. They can only be used in atmospheres with sufficient oxygen and where air contaminants (i.e. - asbestos particles) do not exceed the range specified on the respirator or cartridge. Air purifying respirators generally consist of a soft, rubber facepiece and a replaceable filter or cartridge. The filter must be NIOSH or MSHA approved for protection against airborne asbestos fibers. High efficiency particulate filters (HEPA) are recommended. A typical filter cartridge label appears on the next page. The approval number assigned by NIOSH for this specific manufacturer and model is TC-21C-135. The "TC" indicates "tested and certified"; the "21C" indicates the style/category of respirator; and the "135" indicates the specific manufacturer and model. Note - filters must be periodically replaced according to manufacturers' specifications. If there are any questions regarding filter or respirator approval, contact the Division of Occupational Hygiene.

It is important to note that all respirators require routine inspections, maintenance and fit testing. Refer to Section 13 as well as to manufacturers guidelines on how to care for the respirator and how to check the fit.

There are three subcategories of air purifying respirators described by the type of face piece.

a. Single use disposable (not recommended for asbestos)

b. Reusable Half-Face

c. Reusable Full-Face

In addition there is also a fourth category of

d. Powered Air Purifying Respirators

This type of respirator may have a half or full face piece.

PERMISSIBLE
RESPIRATOR FOR DUSTS, FUMES, MISTS
AND RADIONUCLIDES

MINE SAFETY AND HEALTH ADMINISTRATION
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

MSHA APPROVAL NO. TC-21C-135 NIOSH

ISSUED TO

LIMITATIONS

Approved for respiratory protection against dusts, fumes and mists having a time weighted average less than 0.05 milligram per cubic meter, asbestos-containing dusts and mists and radionuclides

Not for use in atmospheres containing less than 19.5 percent oxygen

Not for entry into atmospheres immediately dangerous to life or health

CAUTION

In making renewals or repairs, parts identical with those furnished by the manufacturer under the pertinent approval shall be maintained

Follow the manufacturer's instructions for changing cartridges

This respirator shall be selected, fitted, used, and maintained in accordance with the Mine Safety and Health Administration, Occupational Safety and Health Administration and other applicable regulations.

MSHA—NIOSH Approval TC-21C-135

Issued to , June 29, 1983

The approved half mask facepiece respirator assembly for dusts, fumes, mists and radionuclides consists of the following parts: 449703, 7-201-1, 7-201-2, or 7-201-3 facepiece and 459322 or 465312 (TC 21C 135) filters

The approved half mask facepiece with belt mounted filter respirator assembly for dusts, fumes, mists and radionuclides consists of the following parts: 7-202-1, 7-202-2 or 7-202-3 facepiece, breathing tube and plenum assembly and 459322 or 465312 (TC 21C 135) filters

Air Purifying Respirator Filter approved for asbestos dust

A. <u>SINGLE USE DISPOSABLE RESPIRATORS</u>

The Division of Occupational Hygiene along with many industrial hygienists, safety professionals, manufacturers and trained individuals strongly recommend against this type of respirator for protection against asbestos dusts. NIOSH has issued a notice stating that despite their required approval, they do not recommend them for protection against asbestos.

Single Use Respirator
Not recommended for protection against asbestos dust

B. REUSABLE HALF-FACE (HALF-MASK) RESPIRATOR

A half-face (half-mask) respirator covers half the face -- from under the chin to the bridge of the nose. Most, but not all, half-mask respirators are NIOSH/MSHA approved. It is necessary to choose the correct approved model for the identified air contaminant. Note the respirator components and the correct position for the head and neck strap.

The half-face respirator must be fit tested (see Section 13) to assure a proper fit. It should be periodically cleaned and inspected as noted in Section 13. The half-face respirator is typically worn when taking samples, repairing pipe covering, or doing a glove bag removal. The reusable half-face respirator (with appropriate filters) is approved for exposures up to 2 fibers/cc.

Reusable Half-Face Respirator

C. REUSABLE FULL-FACE RESPIRATOR

A full-face respirator covers from under the chin up to the forehead. This broader coverage provides a better face fit, higher degree of protection, and gives some eye protection. Many full-face respirators have four or more straps. Regardless of the number of straps, the respirator should be put on by placing the chin into the chin cup, then tightening the straps going from the bottom to the top.

The full-face respirator must also be fit-tested and maintained as described in Section 13. This type of respirator is sometimes used for taking samples, repairing pipe covering or doing a glovebag removal. It is approved for exposures up to 10 fibers/cc.

Full-Face Respirator

D. POWERED AIR PURIFYING RESPIRATORS (PAPR)

The air purifying respirators described previously (in A - C) all depend on breathing energy to draw the air through the respirator cartridge or filter. The powered air purifying respirators (PAPR) use a battery-powered blower that passes the contaminated air through the cartridge or filter. The face covering can be a half-face mask, full-face mask, helmet (hat) or hood.

Powered Air Purifying Respirator

An advantage of using a powered air-purifying respirator is that it supplies air at a positive pressure within the face piece. They thus provide a higher degree of protection since any leak should be outward. Powered air purifying respirators should be maintained and charged according to manufacturers specifications. Although the fit around the face should still be snug, they are not fit-tested as are the other half and full-face respirators. Powered air purifying respirators are approved when the fiber count is less than 20 f/cc.

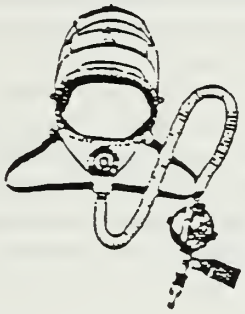
2. AIR SUPPLIED RESPIRATORS (TYPE C RESPIRATORS)

The second major category of respirators, air supplied respirators or airline respirators deliver breathing air through a supply hose connected to the face piece (half or full-mask). They cannot be used in atmospheres immediately dangerous to life or health. If the air supply fails, the worker will be without an air supply. The worker is connected to an outside air source by a hose thus there is some restriction in movement. The air must meet certain quality specifications, therefore it is more common to use a tank system than a compressor. There are regulations on the use of air line respirators:

1. The length of the air line cannot exceed 300 feet

2. The maximum inlet pressure cannot exceed 125 psi.

Air line respirators also have pressure demand and demand regulators which can change the protection factors. The airline respirator can be worn initially on an abatement job until air sampling can prove lower exposure levels. In the field, air line respirators are typically worn for amosite asbestos removals where the fiber count is reasonably expected to exceed 20 fibers/cc.



Air-Supplied Respirator

3. Self-Contained Respirators

Self-contained respirators (also knows as self-contained breathing apparatus or SCBA) provide a separate air supply thus allowing the worker to be independent of his/her surrounding atmosphere. The SCBA can be used in atmospheres which are immediately dangerous to life or health (IDLH) such as an oxygen deficient atmosphere, provided a pressure demand regulator is used. The quality of air must meet certain specifications and the unit can be used in combination with an air-line respirator. The amount of air provided and the use time is dependent on the air pressure and tank size as well as on the breathing demands of the user. A typical air supply lasts 30-60 minutes. The self-contained units provide increased freedom of movement to the worker but they are heavy and awkward to wear and require extensive training to use. The self-contained respirator can be used initially in an asbestos abatement job until air sampling can prove lower exposure levels. These respirators can provide protection when the fiber count is greater than 20 fibers/cc.

Self-Contained Respirator

PROTECTIVE CLOTHING

Because asbestos fibers can be carried into other areas of the building and home on hair, clothes and shoes, protective clothing is advised when performing asbestos abatement work or when entering an area of potential asbestos exposure (i.e., crawl spaces with asbestos floor debris). Disposable suits, head coverings and booties can be put on over regular clothing and disposed of before leaving the contaminated area. Disposable clothing should only be worn once and should never be worn outside the work area. All disposable clothing must be bagged and disposed of as asbestos waste. Each time a worker leaves the contaminated area he/she should dispose of the clothing. A new suit should be worn upon re-entry into the work area. Note - the hood or head covering should be put on over the respirator head straps.

FULL AND HALF-FACE RESPIRATOR FIT TEST

Before the initial use, and periodically, a fit test should be done to assure that the respirator fits properly and does not leak. Note - The respirator will not fit properly with a beard, and it may not fit with a mustache. The half-face respirator fits best when the person is clean shaven. The following check should be done before each use.

Negative Pressure Test

a. Put on respirator and tighten adjusting straps.
b. Cover the inlet opening(s) of the respirator cartridge(s) with the palms of the hand(s). Apply a minimum amount of hand pressure to the cartridges so as not to affect the respirator-face seal.
c. Inhale gently and hold breath for ten seconds. If the facepiece collapses slightly and no leakage of air into the facepiece is detected, it can be reasonably assumed that the respirator-face seal is adequate. If not, readjust mask or head straps and repeat procedure. Note that it is sometimes necessary to try a different size or a different respirator manufacturer.

Positive Pressure Test

a. Put on respirator and tighten adjusting straps.
b. Cover the outlet opening of the exhalation valve with the palm of a hand.
c. Exhale gently and hold breath for ten seconds. If the facepiece bulges slightly and no leakage of air out of the facepiece is detected, it can be reasonably assumed that the respirator-face seal is adequate.

Negative Pressure Test

Qualitative Fit Tests

Irritant Smoke with High Efficiency (HEPA) Filter Cartridge

a. Have worker put on the respirator and tighten adjusting straps.
b. Instruct worker to close their eyes.
c. Hold the smoke tube two feet from the worker's face and direct the smoke over the front and sides of the respirator.
d. If the worker detects any smoke penetration, have them inspect respirator for any defective valves or loose cartridges and then readjust fit of respirator. Repeat b and c.
e. If the worker does not detect any smoke penetration, move the smoke tube six inches from the worker's face and direct the smoke over the front and sides of the respirator.
f. If no smoke penetration is detected, have the worker perform the following exercises while directing smoke at potential points of leakage in the respirator-face seal.

* normal breathing
* deep breathing
* turning head from side to side
* nodding head up and down
* talking
* smiling

A satisfactory fit has been achieved, if the worker is not able to detect any smoke penetration.

Isoamyl Acetate with Organic Vapor Cartridge

a. Instruct the worker to sniff at an open container of liquid isoamyl acetate (banana oil) to test their ability to detect the odor. Use the irritant smoke test with HEPA filters if the worker is unable to detect the isoamyl acetate odor.
b. Have worker put on the respirator and tighten adjusting straps.
c. Saturate a piece of cloth or sponge with liquid isoamyl acetate and place in a dish.
d. Instruct the worker to perform the following exercises while passing the fabric or sponge around potential points of leakage in the respirator-face seal.

* normal breathing
* deep breathing
* turning head from side to side
* nodding head up and down
* talking
* smiling

If the worker detects the odor of isoamyl acetate, have them readjust the fit of the respirator and then repeat the test.

A satisfactory fit has been achieved if the worker is not able to detect the odor of isoamyl acetate.

Note - There are some individuals who cannot wear a particular respirator because of facial scars or shape. If this happens try another type or a different respirator manufacturer.

INSPECTION OF HALF AND FULL-FACE RESPIRATOR

A complete inspection of the respirator should be done before each use. Manufacturers guidelines may vary, so read the literature for the individual respirator for specific details. The general inspection procedure follows:

1. Check inlet valves for tears, distortions and debris. The inlet valve should be flexible not stiff.

2. Check exhalation valve for tears, distortions and debris. Again, the valve should not be stiff. Grab the rubber stem from inside the respirator and twirl it gently. The exhalation valve should move freely.

3. Check the rubber face piece for tears, distortions, debris and stiffening. (Check faceshield for cracks if full face respirator.)

4. Check the head harness strapping for tears or loss of elasticity.

5. Make sure the cap is on the exhalation valve.

6. Check that the proper filters are in place. Check the number of hours of filters use and replace when necessary. (Record number of hours after each use)

7. Check that gaskets are present where the filters screw in. (Some respirators do not have gaskets.)

8. Remove filters and clean respirators after each use.

CLEANING AND DISINFECTING

The following procedure is recommended for cleaning and disinfecting half and full face respirators. Respirators should be cleaned after each use.

1. Remove the filters, cartridges or canisters.

2. Wash rubber face piece in a cleaner disinfectant or detergent solution which will effectively kill bacteria and clean dirt from the parts of the respirator. Quaternary ammonium compounds are generally excellent for this purpose. The respirator may be totally immersed in these solutions and cleaned. (Note - a solution of 2 ml bleach to 1 liter of water or 0.8 ml tincture of iodine to 1 liter of water may be used.)

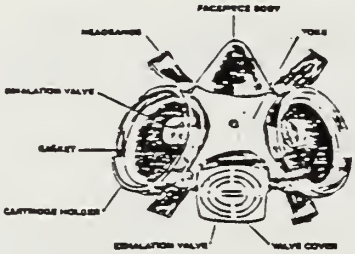
3. Rinse completely in clean warm water.

4. Air dry in clean area.

5. Clean other respirator parts as recommended by manufacturer.

6. Do not put respirator together when wet.

7. When dry, reassemble and store in a clean plastic bag.



Half Face Respirator Parts

Housekeeping and Monitoring Program for Asbestos-Containing Material

The objectives of the Housekeeping and Monitoring Program include the clean up of previously released asbestos fibers, prevention of future asbestos fiber release by reducing damage or disturbance of asbestos material, and the monitoring of the condition of asbestos-containing material.

SECTION I. SPRAYED-ON/TROWELED-ON ASBESTOS SURFACING MATERIAL

Asbestos material of this nature typically covers large areas of the building, thereby potentially affecting large numbers of people. One can find this material on various surfaces such as ceilings, walls, corrugated steel decking, and steel I-beams, to name just a few locations. If the material is friable it can be the main source of airborne asbestos fibers in the building.

A. INSPECTION

Building inspectors and/or custodial personnel should inspect the sprayed-on/troweled-on asbestos material at least twice a year. All observations are to be reported to the asbestos program coordinator. Whether the damage is extensive or minor, the asbestos program coordinator should contact the Division of Occupational Hygiene so some form of remedial action can be coordinated between the two groups. If an emergency situation exists see Section 17, "Asbestos Emergency Procedures", page 17-1. If asbestos debris is found during the inspection, follow the "Asbestos Debris Cleanup Procedures", found in Section 16, page 16-1.

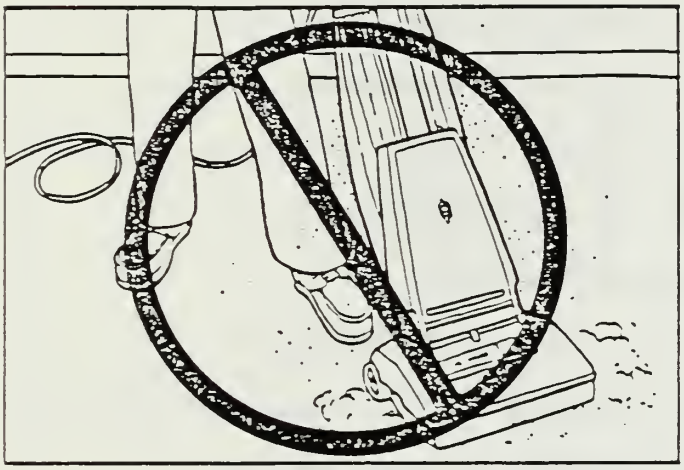
B. HOUSEKEEPING

The first step involves cleaning up the asbestos fibers that might have already been released from the sprayed-on or troweled-on asbestos material. This initial cleaning may involve custodial staff exposure to asbestos fibers. Therefore, personnel involved in the initial clean up should wear half-face reusable respirators. Proper use and care guidelines for the respirator can be found in Sections 12 and 13. The custodial staff should steam-clean all the carpets throughout the building or vacuum them with the HEPA-filtered vacuum cleaner. NEVER USE A CONVENTIONAL VACUUM CLEANER TO CLEAN UP ASBESTOS DEBRIS. (Refer to Page 14-3.) [For proper use and care of the HEPA-filtered vacuum cleaner refer to Section 22.] All curtains and books should be HEPA-vacuumed.

Wet mop all the non-carpeted floors. Wipe all shelves, horizontal surfaces and items on the surfaces with damp cloths. (Refer to Page 14-4.) Mopheads and cloths should be disposed of in a pre-labeled 6-mil polyethylene bags. After use, seal the bag by twisting the top and taping the twisted section with duct tape. Double bag this waste material using another 6-mil polyethylene bag. Dispose of the waste according to the guidelines found in Section 21. Pour the water in the bucket down the sink. Thoroughly wash out the sink and bucket. All filters within the ventilation system should also be changed.

Once the initial cleaning is completed, a monthly cleaning program should be initiated. This includes HEPA-vacuuming carpets, wet mopping floors and damp wiping all other horizontal surfaces. If any asbestos debris is found originating from the asbestos material, follow the "Asbestos Debris Cleanup Procedures" found in Section 16 and notify the asbestos program coordinator of its presence. Dispose of all cleaning material as described above.

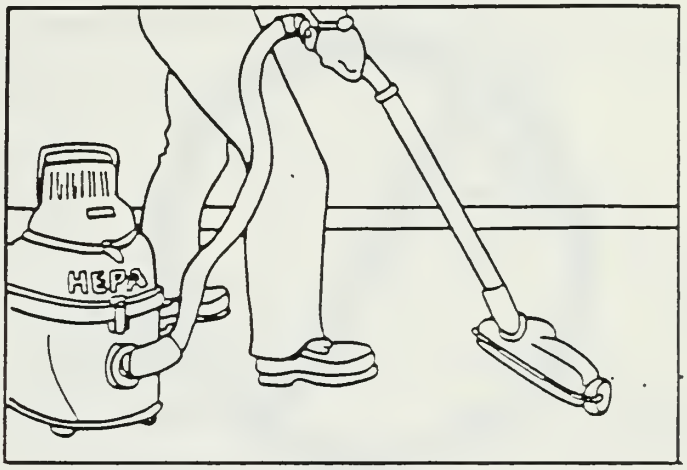
NOT THIS



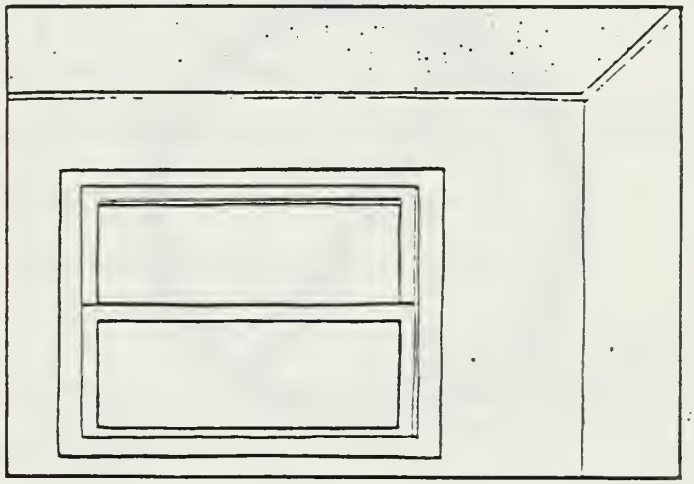
- **Do not** use an ordinary vacuum to clean up asbestos debris.

- **Do not** brush or sweep ceilings and walls covered with asbestos materials.

BUT THIS



- Use only a special HEPA vacuum to clean up asbestos debris.



- Avoid touching or disturbing ceilings and walls covered with asbestos materials.

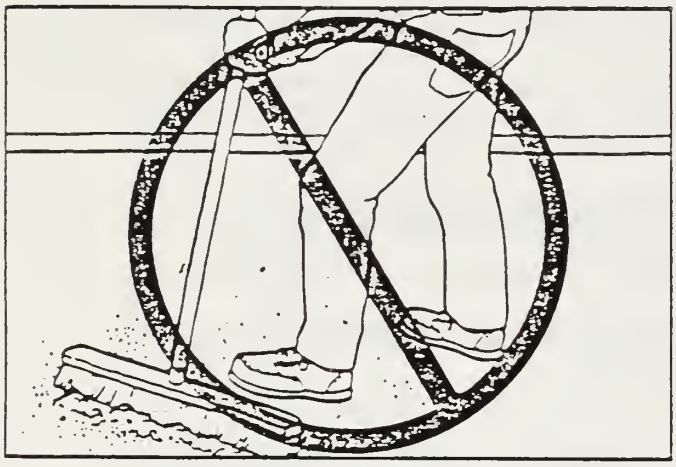
Cleaning

Improper cleaning can stir up asbestos fibers.

Take care when cleaning rooms that contain asbestos materials.

NOT THIS

- **Do not** dust with a brush.



- **Do not** dry sweep floors.

BUT THIS

- Dust with a damp cloth.

- Wet mop floors.

C. PREVENTATIVE MEASURES (Also refer to Page 14-6.)

1. Do not cut, nail or drill into the material without following the procedures in Section 18, "Working With Spray-on".
2. Avoid contact damage to the material
3. Keep suspended ceiling tiles in place
4. Do not hang fixtures, wires etc. on the material
5. Prevent water damage
6. Do not disturb material when replacing lights, etc.
7. Do not allow doors or dividers to rub against the material

SECTION II. PIPE AND BOILER INSULATION

Unless damaged, asbestos-containing pipe and boiler insulation are not a significant source of airborne asbestos fibers. The protective jackets and casings that surround the asbestos insulation effectively prevent fiber release. When the casings become damaged, asbestos fibers can be released from the material.

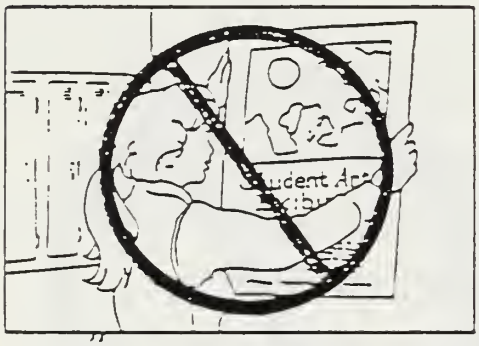
Asbestos-containing insulation can be located on systems or equipment that contain hot liquid or air. These items include pipes, boilers, holding tanks and sometimes ducts. The asbestos insulation was produced and applied in several different forms. The forms include corrugated paper, insulating cement, asbestos fiber felt, preformed fibrous asbestos wrapping or a chalky mixture of asbestos and magnesia. The insulating material is then usually covered with a protective jacket of cloth, tape, paper, cement, or metal.

Disturbing Asbestos Materials

Avoid touching or disturbing asbestos materials on walls, ceilings, pipes or boilers.

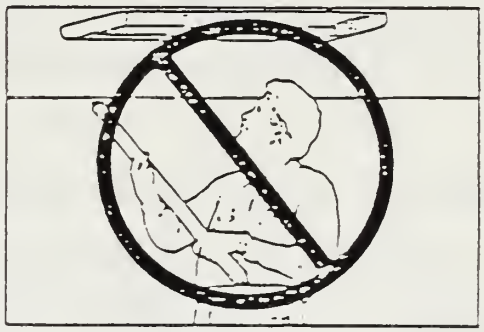
Asbestos fibers can be released when the material is disturbed.

- **Do not** drill holes in asbestos materials
- **Do not** hang plants or anything else from ceilings covered with asbestos materials.

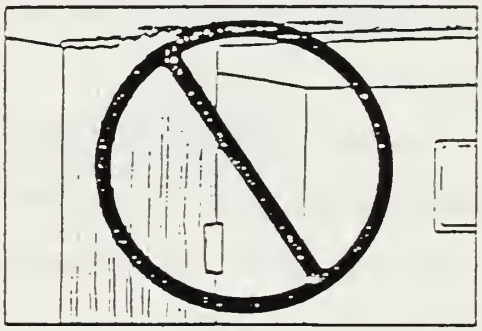


- **Do not** pin or hang pictures on walls covered with asbestos materials.

- **Do not** damage asbestos material while moving furniture, etc.



- **Do not** disturb asbestos material when replacing light bulbs, etc.



- **Do not** allow curtains, drapes or dividers to damage asbestos materials.

Boiler casings may also consist of asbestos thermal bricks or asbestos insulating blankets. Frequently this material is sealed with a finishing cement. Asbestos millboard is also sometimes used as a stiff outside covering on removable boiler insulation.

In areas that contain fiberglass pipe insulation, be sure to check the pipe elbows and joints in the system. The elbow and joint insulation material may contain asbestos.

A. INSPECTION

Once again the building inspectors and/or custodial staff should inspect the boiler and/or pipe insulation at least twice a year. All observations are to be reported to the asbestos coordinator. If the damage is extensive, the asbestos program coordinator should contact the Division of Occupational Hygiene so some form of remedial action can be coordinated between the two groups. If an emergency situation exists see Section 17, "Asbestos Emergency Procedures". If asbestos debris is found during the inspection, follow the "Asbestos Debris Cleanup Procedures", found in Section 16.

B. HOUSEKEEPING

An initial cleaning should be performed as described before in Section IB. The custodial staff should clean the carpets in the rooms that contain heating, cooling, or air handling systems that are covered with asbestos insulation. Use a HEPA-filtered vacuum cleaner or steam cleaner. All curtains within these rooms should also be HEPA-vacuumed. NEVER USE A CONVENTIONAL VACUUM CLEANER TO CLEAN UP ASBESTOS DEBRIS!

Uncarpeted floorspace in a room with asbestos insulation should be wet-mopped. Wipe all other horizontal surfaces with damp cloths. Mopheads and cloths should be disposed of in a pre-labeled 6-mil polyethylene bags. After use, seal the bag by twisting the top and taping the twisted section with duct tape. Double bag the waste material using another 6-mil polyethylene bag.

Dispose of the waste according to the guidelines found in Section 21. Pour the water in the bucket down the sink. Thoroughly wash out the bucket and sink.

The following procedures should be performed by custodial personnel twice a year:

- HEPA-vacuum all carpets in rooms with heating, cooling or air handling systems insulated with asbestos containing material.

- All other floors and horizontal surfaces should be wet-mopped or dusted with damp cloths in rooms with asbestos-containing insulation.

- If any asbestos debris is found originating from the asbestos material, follow the "Asbestos Debris Cleanup Procedures" and notify the asbestos program coordinator of its presence. Dispose of all cleaning material as described above.

C. PREVENTATIVE MAINTENANCE

The following actions are not to be done without proper work procedures, notification, or protective equipment:

1. Do not cut, nail, or drill into the asbestos material.
2. Avoid contact damage with the asbestos material.
3. Do not hang fixtures, wires, etc. on the asbestos material.
4. Do not place furniture up against the asbestos pipe insulation.

GLOVE BAG REMOVAL TECHNIQUE

The glovebag technique is designed for removal of asbestos with minimal exposure to workers. The glovebag is used for removal of asbestos covered pipes or valves. The technique is described for use by public employees who may find it necessary to remove small quantities (i.e., less than three square or linear feet) of asbestos in order to repair a broken valve or work on a leaky pipe. The Division of Occupational Hygiene recommends that removal of asbestos not be performed by State employees unless it is secondary and incidental to the performance of another job activity. If the following procedures are followed closely, the worker can protect himself and others from asbestos fibers.

Important - No State employee should remove asbestos until he/she has attended the Division of Occupational Hygiene's hands-on glovebag removal seminar. The D.O.H. will be training workers at most state facilities. If you have any questions please contact the D.O.H. at 969-7177.

OVERVIEW OF THE GLOVEBAG PROCEDURES

The glovebag consists of a 6-12 mil polyethylene bag fitted with long sleeve gloves, a tool pouch and a two-inch opening used for water application. The size, quality, style and cost vary depending on the manufacturer. In addition to the glovebag, several other tools and materials are commonly required to perform the project successfully. These materials, listed below, are readily available from most asbestos abatement contractor suppliers and from your local hardware store.

Required Materials

1. GLOVEBAG
2. PUMP-UP GARDEN SPRAYER (2-3 gallon) with hose at least 6 feet long
3. SURFACTANT (i.e. 50% polyoxyethylene ester and 50% polyoxyethylene ether) or equivalent
4. DUCT TAPE (3 inch width)
5. PRE-LABELLED POLYETHYLENE ASBESTOS DISPOSAL BAGS (6 mil thickness)
6. 16-INCH BONE SAW (Flexi saw; a serrated heavy gauge wire with ring-type handles at each end - see picture next page)
7. UTILITY KNIFE WITH RETRACTABLE BLADE
8. HAND HELD SCRUB BRUSH (nylon bristles)
9. SEVERAL RAGS
10. REWETTABLE FIBERGLASS CLOTH (a plaster impregnated fiberglass webbing available through many insulation suppliers)
11. ZIP LOCK PLASTIC BAG (approximately 8" x 10")
12. HAND STAPLER AND STAPLES
13. POLYETHYLENE PLASTIC (roll of 4 or 6 mil)
14. ASBESTOS CAUTION SIGNS AND LABELS
15. ROPE
16. SMOKE TUBES
17. ASPIRATOR BULB WITH 6 INCHES OF TUBING
18. HEPA VACUUM CLEANER (wiring must include a ground plug or ground fault ciruit interrupter)
19. WATER BUCKET

20. RUBBER DUSTPAN OR SHOVEL

21. ICE SCRAPER, GARDEN TROWEL OR PUTTY KNIFE

22. SPRAY BOTTLE (mister)

23. STRING

24. SCISSORS

25. DUAL CARTRIDGE, REUSABLE HALF-FACE RESPIRATOR with high efficiency particulate air cartridges

26. DISPOSABLE SUITS, BOOTIES, HOOD OR HEAD COVERING

27. PAINT OR ENCAPSULANT with appropriate fire rating

May be Necessary

1. Wire cutters

2. Tin snips (if aluminum jacket present)

3. Reinsulation Material

BONE SAW

I. Prework Procedures

Only those persons who have been trained on the use and limitations of glovebag removal projects and the basics of respiratory protection should perform the removal. It is best to have two people present throughout the procedure. One person will perform the removal while the other one wets the material. The Division of Occupational Hygiene should be notified prior to any removal work (969-7177).

1. Check the temperature of the pipes. NEVER PERFORM A GLOVEBAG REMOVAL ON HOT PIPES (OVER 150°F)! High temperatures can cause the bag or gloves to melt over the workers hand and arms. If the pipe temperature is over 150°, the heat source to this pipe must be temporarily shut off and the pipe allowed to cool before work begins.

2. Gather all necessary materials and supplies. Rope off the work area and post asbestos warning signs around the perimeter so that other people will not enter the area.

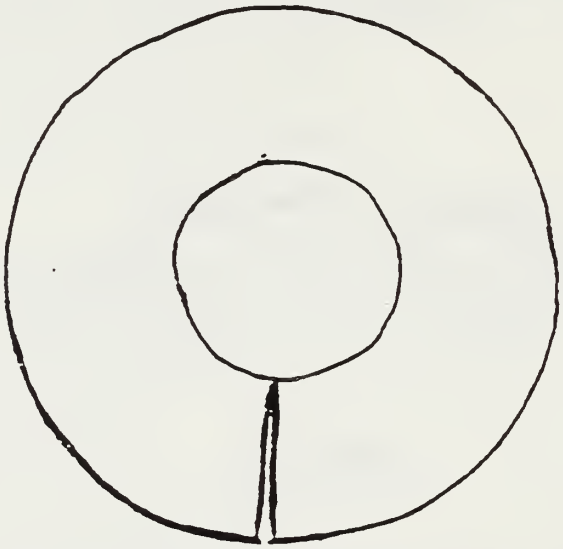
3. Mix one ounce of surfactant with every 5 gallons of water and place in the garden sprayer and mister. (Note - check manufacturers guidelines for mixing ratio also). Half fill the water bucket with water.

4. Duct tape 6 mil polyethylene sheeting onto the floor in the immediate work area.

5. If possible shut down the heating, ventilation and air conditioning (HVAC) system serving the area. Alternatively seal off all vents with polyethylene.

6. Review "Emergency Procedures" for glovebag (p. 17-5).

7. Cut two donut shaped pieces of rewettable fiberglass cloth. The inner diameter should be 1/2 inch smaller than the diameter of the pipe <u>beneath</u> the insulation. The outer diameter of the donut should be about 3 inches longer than the diameter of the pipe <u>with the insulation</u>. Cut a slit through the one side of the donut. Place both pieces in the zip lock bag.



Donut-shaped piece of Rewettable fiberglass cloth

II. <u>Worker Protection</u>

1. Put on respirator and check fit. (See Respiratory Protection - Section 12)

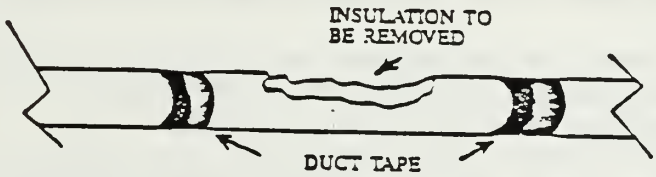
2. Put on disposable full body suit, head covering and booties. Remember - head covering goes <u>over</u> respirator straps.

III. <u>Setting up the Glovebag</u>

1. Check the pipe where the work will be performed. If there are areas of damaged pipe covering around the section to be removed either patch with rewettable fiberglass cloth or wrap the entire length of the pipe with polyethylene plastic and candystripe it with duct tape.

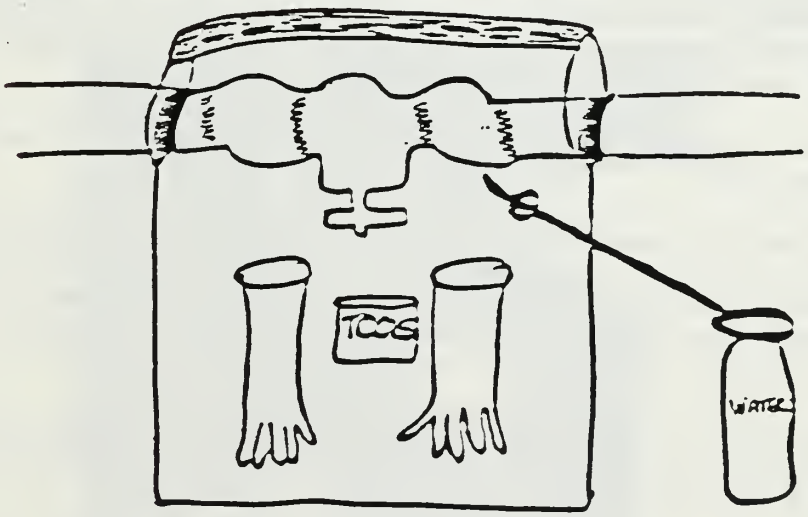
A common error when doing glovebag removals is forgetting that loose pipe lagging several feet or several yards away may be jarred loose from the activity, thus generating airborne fibers. After the removal is completed, the polyethylene should be disposed of as asbestos waste and any debris cleaned up according to "Asbestos Debris Cleanup Procedures". (page 16-1.)

2. Place 2 layers of duct tape around the pipe at each end where the glovebag will be attached. (Determine this by holding the glovebag up to the pipe to see the length). This serves two purposes. First it provides a good surface on which to seal the ends of the glovebag and second it minimizes the chances of releasing fibers when the tape



3. With scissors, slit the top of the glovebag open if necessary, and cut down the side seams approximately eight inches longer than the pipe diameter. (Note - some brands have zipper tops and straps thus this step may not be necessary).

4. Run duct tape horizontally along one of the top seams for reinforcement.



Glovebag Setup

5. Place the following tools into the pouch inside the glovebag:

   1. bone saw

   2. utility knife (closed)

   3. rags

   4. nylon scrub brush

   5. rewettable fiberglass cloth (placed first in ziplock bag)

   6. If necessary - wire cutters or tin snips to cut wire hangers or aluminum jackets.

MAKE SURE ALL THE NECESSARY TOOLS ARE IN THE BAG BEFORE PROCEEDING FURTHER

6. Place the glovebag around the section of pipe to be worked on and staple the top together through the reinforcing duct tape. Staple at one inch intervals.

7. Fold the stapled section over and tape it horizontally to the glovebag with duct tape. Note - it will seal best if you use a few shorter pieces of tape rather than one long strip.

8. Lift the glovebag up so that the bottom of the pipe is flush against the end of the side slit on the glovebag. Duct tape the ends of the glovebag to itself and to the strip of duct tape previously placed on the pipe covering. Note - There should be adequate room at the top of the glovebag to reach over the top of the pipe. If the glovebag is not lifted up and taped there will be insufficient room to cut the top of the asbestos covered pipe. (See illustration above).

IV. Checking the bag for leaks before removal

1. Poke a small hole through the prelabelled water hose patch (if one present) or alternatively reinforce a two-inch section of the glovebag (above and to the side of one of the gloves) with duct tape and then slice a small hole through the tape just large enough for the smoke tube end to be put into.

2. Precut a few pieces of duct tape and set aside for patching holes or leaks.

3. Holding the smoke tube down into wastebasket, carefully snap off one tip (i.e. with tin snips) of the tube and place into the tubing attached to the aspirator bulb. Eye protection should be worn to protect from stray pieces of glass. Note - the smoke is a skin and eye irritant so avoid contact.

4. Snip off the other end of the smoke tube as described previously and place immediately into the hole, being careful not to puncture other areas of the bag.

5. Squeeze the aspirator bulb until the bag fills with visible smoke. Remove the smoke tube and place a small piece of duct tape over the hole. (Once the bag has been determined to be well sealed, place the smoke tube in the bucket of water for 5-10 minutes and then remove the tube and throw away).

6. Gently squeeze the glovebag and look for leaks. Patch all leaks with duct tape.

7. When no further leaks are found, set the HEPA vacuum to the low volume setting and turn it on. Place the vacuum hose over the hole where the smoke tube was originally for a few seconds to remove the majority of the smoke. Do not fully collapse the bag.

V. Removal

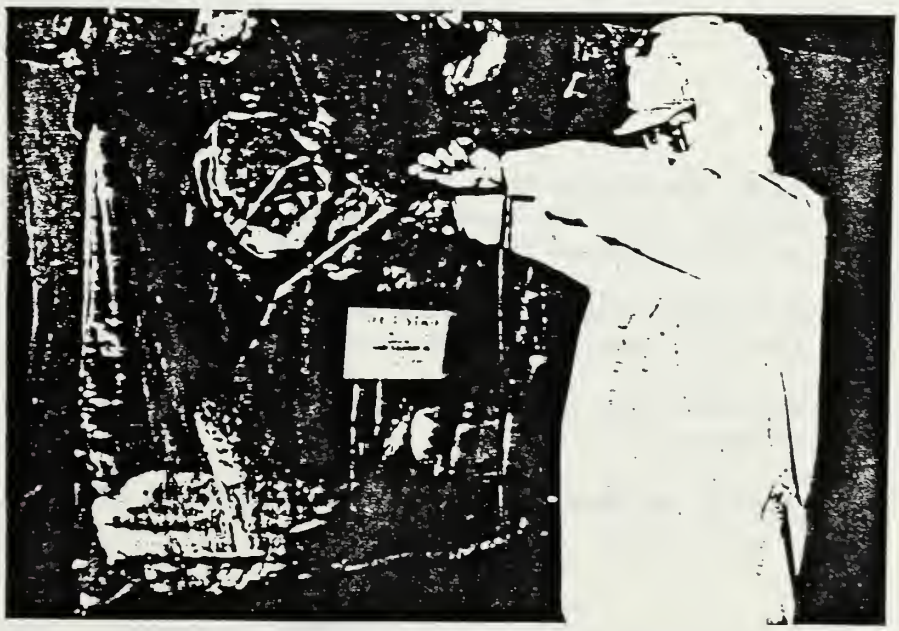
1. Insert the wand of the garden sprayer through the reinforced hole up to the handle and tape it securely with duct tape so that there are no leaks.

2. All work (except for the water spraying) will now be done through the gloves. If an aluminum jacket is present, remove with tin snips and wire cutters. Fold the sharp edges inward to prevent cutting the bag and place gently in the bottom of the bag. Be careful not to cut yourself on the sharp edges. The insulation should now be exposed.

3. Wet the asbestos material thoroughly. Holding the handles of the bone saw begin cutting through the asbestos. It may be easier to cut the bottom half first. Water should be sprayed on the cutting area and sides of the bag thoughout the process to keep dust to a minimum. Do not use excessive water as this may weigh down the glovebag and cause it to pull away from the pipe. If possible the bottom of the bag should be supported (i.e. - using a chair).

** DO NOT CUT THROUGH THE PIPE - THE BONE SAW IS EXTREMELY SHARP **

4. Horizontally slice through the bottom or seam of the insulation from end to end with the utility knife (being careful not to cut the bag) and gently place the insulation in the bottom of the bag. Wet the material on the bottom of the bag as well as any remaining debris on the pipe.



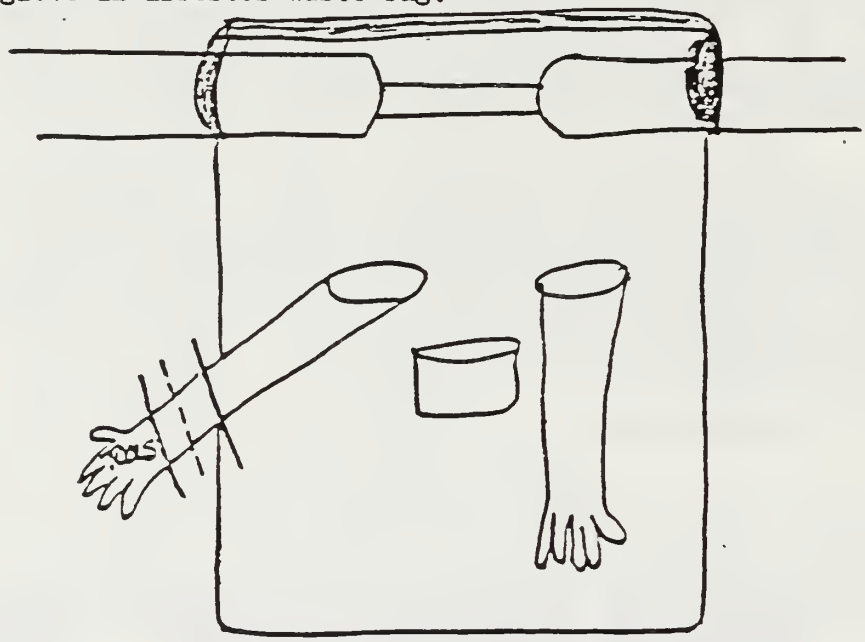
ASBESTOS MATERIAL IS KEPT WET THROUGHOUT REMOVAL

5. Clean all debris off pipe with water, scrub brush and rags. Clean off excess debris on the exposed ends remaining on the pipe.

6. Wet the donut shaped pieces of rewettable fiberglass cloth and apply to exposed ends of asbestos being careful to enclose all visible insulation.

7. Spray down the inside of the bag and clean off the retractable knife and bone saw (also the wire cutter and tin snips if used). The rags and scrub brush should be left in the bag and thrown out with the rest of the waste since they cannot be adequately cleaned.

8. Grab the cleaned tools with one glove and invert the glove to the outside of the bag. Tie off the glove with string at two areas and cut the glove between the two sealed areas. Place the section of glove containing the tools in the water bucket. Open this glove underwater and clean all tools in the water. Remove any gross chunks of debris and place in pre-labelled asbestos waste bag. Dispose of glove in asbestos waste bag.



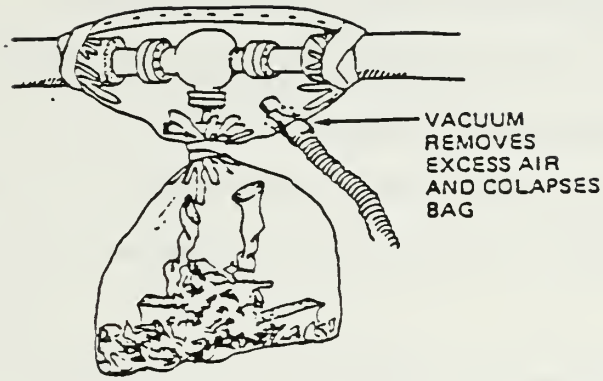
REMOVING TOOLS FROM GLOVEBAG

9. Twist the bag several times at the midsection (below the water sprayer hole) and tape it. This will isolate the containment debris in the bottom of the bag while the glovebag is removed from the pipe.

10. Carefully remove the water wand from the bag and attach the nozzle of the HEPA vacuum into the hole.

11. With the HEPA vacuum on the low flow setting, gently collapse the glovebag.

12. Remove the vacuum nozzle and seal off the hole with duct tape.



Twist bag and collapse top with vacuum

13. Slip the prelabelled 6 mil bag around the glovebag (still attached to the pipe). Cut open the top of the glovebag and fold it down into the disposal bag. Do not remove duct tape attached to pipe.

14. Remove the disposable suits and place in bag. Fold the poly on the floor inwards and place in bag.

15. Twist the top of the bag and seal with duct tape. Make sure the bag is properly labelled.

16. Remove the respirator and clean (See "Respirator Protection").

17. After rewettable fiberglass cloth has dried, paint over with appropriate paint or encapsulant.

(Note - asbestos and asbestos containing material must be disposed of in accordance with State (DEQE) and Federal (EPA) regulations. Contact DEQE for location of the nearest approved landfill).

ASBESTOS DEBRIS CLEANUP PROCEDURES

Any debris suspected of containing asbestos found on the floor, building structures, or items within the building should be cleaned up immediately. Asbestos debris can be a serious health risk. The material is usually extremely friable and the asbestos fibers within the debris can be readily released into the air.

If the asbestos debris is 3 square/linear feet or greater, the cleanup should be performed by an Asbestos Abatement Contractor. See Section 10, Page 10-1 for the state's policy on asbestos removal.

If the asbestos debris is less than 3 square/linear feet, follow the procedures presented below.

Equipment you will need to perform a proper asbestos debris cleanup:

1. Large garden sprayer or small plant mister filled with amended water
2. 6 mil pre-labeled polyethylene storage bags
3. Asbestos hazard or warning labels
4. HEPA-filtered vacuum cleaner
5. Mop and bucket filled with amended water
6. Rags
7. Duct tape
8. Shovel, Dustpan/or garden trowel
9. Ice Scraper or another dustpan
10. Half-face reusable respirator with NIOSH/MSHA approved cartridges and filters
11. Protective disposable clothing
12. One roll of 12' x 100' polyethylene sheeting (4 or 6 mil)
13. Zip-lock freezer bags large enough to hold respirator.

CLEANUP PROCEDURES

Step 1 - Remove all personnel from the immediate area and contact the supervisor, facility manager or asbestos coordinator. The number of times essential personnel enter the area should be limited.

- Essential personnel entering the area should wear respiratory protective equipment (i.e...a half-face reusable respirator with NIOSH/MSHA approved cartridges or canisters, powered air supply purifying respirator, etc.) and disposable protective clothing. The personnel should be fully trained in the use and care of the protective equipment.

Step 2 - Isolate the area. This could be as easy as locking all doorways leading into the emergency area and posting the asbestos caution signs or labels on the inside and outside of the door.

- If the area can not be sealed off because of the lack of doors or other reasons, use the polyethylene sheeting and duct tape to create a substitute door or wall. This can be accomplished by cutting a piece of polyethylene sheeting that is about a foot larger than the opening. Duct tape the plastic to the walls, ceiling, and floor. Once again place the asbestos caution signs or labels on the polyethylene sheeting. All vents and ducts leading into or out of the emergency area should be sealed with polyethylene sheeting and duct tape.

Step 3 - If the asbestos debris is dry or damp (NOT WET) and small in size:

A. Vacuum up the asbestos material using the HEPA-filtered vacuum cleaner.

B. Thoroughly wet mop all of the structures and items that asbestos debris has fallen on. If the asbestos has fallen on a carpeted floor you have the option of steam-cleaning after vacuuming with the HEPA-filtered system.

C. Make sure all visible debris is removed from the structures or items.

D. Dispose of the protective clothing, mopheads, and rags into a 6-mil (pre-labeled) polyethylene disposable bag. Twist the top of the polyethylene bag and seal it with duct tape. Double bag the waste material with another 6-mil (pre-labeled) polyethylene bag. Dispose of the bagged asbestos waste according to guidelines presented in Section 21 "Waste - Storage / Transport / Disposal", page 21-1.

E. Remove respirator and place in the zip-lock bag. Perform respirator cleaning and disinfecting steps outlined in Section 13, "Respirator - Fit Test / Cleaning", page 13-3.

F. Pour the dirty water in the bucket down the sink. Thoroughly wash out the bucket and sink.

G. Go to "STEP 5".

Step 4 - If the asbestos debris is too wet and/or large to be vacuumed:

A. Thoroughly wet down the asbestos material and the area surrounding it with the garden sprayer. Use a light mist of water when wetting the area and material.

B. If the material is intact and too large to be easily handled with a shovel, you may pick up the wet material and place it in a pre-labeled 6 mil polyethylene disposable bag.

C. Scoop up smaller debris with a shovel, dust pan or garden trowel and place in a pre-labeled 6 mil polyethylene bag.

D. Use another washable item, such as another garden trowel or ice scraper, to push the material into your shovel, dustpan or trowel. DO NOT USE A BROOM OR BRUSH! Not only will the brush or broom be hard to clean but there is a greater chance for asbestos fiber dispersal when using these items. Do not keep or reuse them.

E. Wash all items used in the cleanup. This includes hands, shovel, ice scraper, etc. Hold the items over the pre-labeled 6 mil polyethylene bag and wash them thoroughly with the large garden sprayer/small plant mister. NOTE: If certain washed items will not come clean, throw them away with the asbestos debris.

F. Wet mop the entire area and/or items with which the asbestos material came in contact. If the floor is carpeted, vacuum the carpet with a HEPA-filtered vacuum cleaner. If the carpet is wet, or the debris is wet, the carpet must be steam cleaned. You cannot use a HEPA-filtered vacuum cleaner to pick up water or wet material.

G. Dispose of the protective clothing, mopheads, and rags into a 6-mil (pre-labeled) polyethylene disposable bag. Twist the top of the polyethylene bag and seal it with duct tape. Double bag the waste material with another 6-mil (pre-labeled) polyethylene bag.

H. Place your half-face reusable respirator into a zip-lock freezer bag and follow the cleaning procedures found in Section 13, "Respirator - Fit Test / Cleaning", page 13-3.

I. Pour the water in the bucket down the sink. Thoroughly wash out the bucket and the sink.

J. Dispose of the waste material according to the guidelines found in Section 21 "Waste - Storage / Transport / Disposal", on page 21-1.

Step 5 - After this initial clean-up, wait for the area to dry. Keep all personnel out of the area and limit the number of times essential personnel will be entering the area. The initial barriers and posted warning signs should remain up until the final cleanup is finished.

When area is dry, inspect for any visible asbestos debris. Sometimes wet asbestos debris becomes hidden during the clean-up. If any visible asbestos material is found, repeat the wet mop or HEPA-vacuuming procedure until no visible asbestos debris is observed. When the area has been determined to be clean, carefully remove barriers and posted warning signs. Place this waste material in a 6-mil pre-labeled polyethylene disposable bag and dispose of it according to Section 21 on page 21-1.

If at any time you require assistance, or explanations regarding the procedures, please call the Division of Occupational Hygiene at:

(617) 969-7177

ASBESTOS EMERGENCY PROCEDURES

Emergency procedures are always more effective when read before an accident or emergency takes place. Please take the time to read this section carefully and become familiar with the procedures. Also, refer to any emergency procedures set up by the management or supervisoral staff at the facility.

Q. What constitutes an asbestos emergency?

A. Any situation in which there has been a change in the condition of the asbestos material resulting in the release of asbestos fibers into the air, contaminating or exposing the surrounding environment and/or people within. Some examples of emergencies are (1) a valve that is covered with an asbestos casing bursts, (2) extensive water damage to an asbestos spray-on ceiling, and (3) sections of asbestos pipe coverings becoming extensively damaged.

The emergency procedures are divided into two sections.

ASBESTOS EMERGENCY PROCEDURES ARE FOUND ON page 17-2.

GLOVEBAG EMERGENCY PROCEDURES ARE FOUND ON page 17-5.

The following is an equipment list of items the facility should have on hand <u>before</u> an emergency takes place. All items listed can be used for an asbestos emergency or a glovebag emergency.

EMERGENCY EQUIPMENT LIST

1. Protective disposable clothing
2. Half-face reusable respirators equipped with NIOSH/MSHA approved asbestos dust cartridges or canisters
3. Asbestos caution signs and/or labels
4. Duct tape
5. 1 roll of 12' x 100' 4 or 6-mil Polyethylene sheeting
6. 6-mil (pre-labeled) polyethylene disposal bags

7. Rewettable fiberglass cloth
8. HEPA-filtered vacuum cleaner
9. Mop and bucket containing amended water
10. Rags
11. Garden sprayer
12. Shovel, dustpan and/or garden trowel
13. Ice scraper

ASBESTOS EMERGENCY PROCEDURES

STEP 1 - Remove all personnel from the immediate area and contact the supervisor, facility manager or asbestos coordinator. The number of times essential personnel enter the area should be limited.

- Essential personnel entering the area should wear respiratory protective equipment (i.e...a half-face reusable respirator with NIOSH/MSHA approved cartridges or canisters, powered air supply purifying respirator, etc.) and disposable protective clothing. The personnel should be fully trained in the use and care of the protective equipment.

STEP 2 - Isolate the area. This could be as easy as locking all doorways leading into the emergency area and posting the asbestos caution signs or labels on the inside and outside of the door.

- If the area can't be sealed off because of the lack of doors or other reasons, use the polyethylene sheeting and duct tape to create a substitute door or wall. This can be accomplished by cutting a piece of polyethylene sheeting that is about a foot larger than the opening. Duct tape the plastic to the walls, ceiling, and floor. Once again place the asbestos caution signs or labels on the polyethylene sheeting. All vents and ducts leading into or out of the emergency area should be sealed with polyethylene sheeting and duct tape.

STEP 3 - If the asbestos debris or material causing the emergency is less than 3 square or 3 linear feet, then follow steps 3 thru 5 of the "Asbestos Debris Cleanup Procedures" found on page 16-2. If the asbestos material is greater than or equal to 3 square/linear feet, DO NOT TOUCH OR REMOVE THE ASBESTOS, GO TO STEP 4.

STEP 4 - IF THE EMERGENCY OCCURS ON THE WEEKEND, follow the procedures or protocol for handling asbestos emergencies planned by the management, supervisory staff, or asbestos coordinator at the facility.

Contact the Division of Occupational Hygiene Asbestos Program as soon as possible after or during the emergency. The office is open Monday thru Friday, 8:00 to 5:00. The phone number is:

(617) 969-7177

Ask for a staff member of the Asbestos Program. Have on hand the following information:

a. Your name.

b. State division or department.

c. The state building in which you are employed and the town in which it is located.

d. Where in the building the emergency is taking place.

e. The material involved. (i.e., a spray-on ceiling, pipe covering, debris on the floor...)

f. Amount of material involved. (i.e., less than 3 square or linear feet?)

g. Observations of the area of concern. Make these as detailed as possible, including circumstances by which the emergency occurred, what the area of concern looks like, how damaged the suspect materials is, etc.

h. Any other information you feel is important

From the information you give, the industrial hygiene engineer you are talking with may be able to determine whether or not a real emergency is occurring. If an emergency is taking place or the industrial hygiene engineer is not able to determine from the given information whether an emergency exists, an immediate investigation will be initiated by the Division of Occupational Hygiene. This investigation will include a complete on-site survey, an interview with personnel involved in the emergency situation, and any necessary remedial action.

STEP 5 - Follow all guideline(s), recommendation(s) or action(s) given verbally on the phone by the industrial hygiene engineer.

GLOVEBAG EMERGENCY PROCEDURES

Q. What is a glovebag emergency?

A. When the glovebag has been ripped, torn, or ruptured. Immediate action should be taken to remedy the situation.

STEP 1 - Has any asbestos material fallen outside the bag?

NO - Seal the damaged area of the glovebag with duct tape. If the bag has fallen off the pipe, close the damaged glovebag and seal it with duct tape. Dispose of the glovebag in a 6 mil (pre-labeled) polyethylene disposable bag. Seal all exposed asbestos pipe covering with rewettable fiberglass.

YES - Reseal the damaged area of the glovebag with duct tape. If the damage is so extensive that the glovebag cannot be sealed or repaired, take a 6 mil (pre-labeled) polyethylene disposable bag and place the damaged glovebag into the disposable polyethylene bag. (NOTE: Avoid stepping in the asbestos material that has dropped to the floor.) Try to keep as much asbestos material in the glovebag as possible when placing it into the disposable polyethylene bag. Seal the disposable bag by twisting the top, then wrapping the twisted section with duct tape. Once again, if the bag has fallen off the pipe, seal all exposed asbestos pipe coverings with rewettable fiberglass.

STEP 2 - CLEANUP OF ASBESTOS DEBRIS: If the asbestos debris is damp (NOT WET) and small in size:

a. Vacuum up the asbestos material using the HEPA-filtered vacuum cleaner.

b. Thoroughly wet mop all of the structures and items that asbestos debris has fallen on.

c. Make sure all visible debris is removed from the structures or items.

d. Additional step for a carpeted floor: Carefully peel the polyethylene sheeting off the carpet, collapsing the sheeting inward. Fold the sheet so the wet-contaminated side is inward. Dispose of the sheet into a 6 mil polyethylene disposable bag.

e. Dispose of the mopheads and rags into the 6-mil (pre-labeled) polyethylene disposable bag. Twist the top of the polyethylene bag and seal it with duct tape. Double bag the waste material with another 6-mil (pre-labeled) polyethylene bag. Dispose of the bagged asbestos waste according to guidelines presented in Section 21 "Waste - Storage / Transport / Disposal", page 21-1.

f. Pour the dirty water in the bucket down the sink. Thoroughly wash out the bucket and sink.

g. Complete any unfinished asbestos removal work using the Glovebag Removal Technique found in Section 15, page 15-1. Notice that because of the emergency, one must start at the beginning of the Glovebag Procedures.

If the asbestos debris is too wet and/or too large to be vacuumed:

a. Thoroughly wet down the asbestos material and area surrounding it with the garden sprayer. Start with a light mist of water and continue until material is thoroughly wet.

b. If the material is intact and too large to be easily handled with a shovel, you may pick up the wet material and place it in a polyethylene disposable bag.

c. Scoop up smaller debris with a shovel, dust-pan or garden trowel and place in a pre-labeled 6 mil polyethylene disposal bag.

d. Use another washable item, such as another garden trowel or ice scraper, to push the material into your shovel, dustpan or trowel. DO NOT USE A BRUSH OR BROOM! Not only will a brush or broom be hard to clean but there is a greater chance for asbestos fiber dispersal when using these items.

e. Wash all items used in the cleanup. This includes hands, shovel, ice scraper, etc. Hold the items over the pre-labeled 6 mil polyethylene disposal bag and wash them thoroughly with the garden sprayer.

NOTE: If certain washed items will not come clean, throw them away with the asbestos debris. Do not keep or reuse them.

f. Wet mop the entire area and/ or items with which the asbestos material came in contact. If the floor is carpeted, carefully peel the polyethylene sheeting off the carpet, collapsing the sheeting inward. Fold the sheet so the wet-contaminated side is inward. Dispose of the sheet into a 6 mil polyethylene disposable bag.

g. Dispose of the mopheads and rags into the 6-mil (pre-labeled) polyethylene disposable bag. Twist the top of the polyethylene bag and seal it with duct tape. Double bag the waste material with another 6-mil (pre-labeled) polyethylene bag. Dispose of the bagged asbestos waste according to guidelines presented in Section 21 "Waste - Storage / Transport / Disposal", page 21-1.

h. Pour the dirty water in the bucket down the sink. Thoroughly wash out the bucket and sink.

i. Complete any unfinished asbestos removal work using the Glovebag Removal Technique found in Section 15, page 15-1. Notice that because of the emergency one must start at the beginning of the Glovebag Procedures.

Step 3 - After this initial clean-up, wait for the area to dry. Keep all personnel out of the area. The initial barriers and posted warning signs should remain up until the final cleanup is finished.

When area is dry, inspect for any visible asbestos debris. Sometimes wet asbestos debris becomes hidden during the clean-up. If any visible asbestos material is found, repeat the wet mop or HEPA-vacuuming procedure until no visible asbestos debris is observed. When the area has been determined to be clean, carefully remove barriers and posted warning signs. Place this waste material in a 6-mil pre-labeled polyethylene disposable bag and dispose of it according to Section 21 on page 21-1.

If at any time you require assistance, or explanations regarding the emergency procedures, please call the Division of Occupational Hygiene at:

(617) 969-7177

WORKING WITH SPRAY-ON MATERIAL

If it is necessary to work in an area with spray-on asbestos material the following precautions should be taken.

Equipment List

1. NIOSH/MSHA approved respirators with HEPA filters.
2. Disposable clothing, head coverings and booties.
3. HEPA vacuum.
4. Spray encapsulant (available through asbestos abatement or safety suppliers) to seal in asbestos fibers once material is cut into.
5. Polyethylene sheeting and duct tape.
6. Pocket knife or scissors.
7. Asbestos Warning signs.
8. Spray bottle filled with water and surfactant. (Refer to manufacturer's instructions for mixture ratio.)
9. Water bucket.
10. Asbestos disposal bag.
11. Other tools necessary to perform particular job.

1. Working above suspended ceiling where spray-on material is present (Note - only equipment listed 1-3 above is needed if asbestos is not to be cut into.)

   a. Wear approved respirators.

   b. Wear disposable clothing.

   c. Gently remove the suspended ceiling tile.

   d. HEPA vacuum any debris on top of the ceiling tile.

2. Cutting into spray-on material (NOTE - No more than three square feet of material should be cut into. If a large area of spray-on is to be cut into, hire an asbestos removal contractor. Refer to page 10-1 and Section 10 for further information).

a. Isolate the work area by sealing off the doors, walls and floor in the immediate vicinity with polyethylene sheeting and duct tape.

b. Establish an entry way by doing the following:

   1. Place a 5-6 foot strip of duct tape vertically in the middle of the polyethylene over the doorway.

   2. Cut a slit through the duct tape and polyethylene to create an opening. (The duct tape will reinforce the opening.)

   3. Place a flap of polyethylene on each side of the slit piece of polyethylene by duct taping only the top of each flap.

c. Post signs warning of asbestos hazard outside the sealed area.

d. Wear an approved respirator and disposable clothing.

e. Thoroughly wet both the area of spray-on to be cut and the spray-on immediately around this area. (Use water containing surfactant if possible). NOTE - Use a fine mist and gradually soak the material since a strong stream of water can disperse fibers.

f. Holding or placing a plastic bag or bucket under the area, gently cut into the material so that most of the debris falls into the bag or bucket.

g. Use a spray encapsulant in the cut area to seal the asbestos. (Refer to manufacturer's instructions for details.)

h. Check the area for asbestos debris. Clean up any debris according to the guidelines noted in "Asbestos Debris Cleanup Procedures". (Refer to Section 16, steps 3 or 4.)

i. Clean all tools, bucket etc. by rinsing off debris with spray bottle into the asbestos waste bag.

j. Fold polyethylene on walls and door inwards so that any debris falls on the polyethylene on the floor.

k. Fold polyethylene on floor inwards.

l. Remove disposable suit and dispose of suit and polyethylene in labelled asbestos waste bag.

m. Twist top of bag and seal with duct tape. Double bag debris and refer to Section 21 for disposal procedures.

n. Remove and clean respirator, according to guidelines outlined on page 13-3.

Safe Repair Practices for Pipe and Boiler Insulation

If less than three square or three linear feet of asbestos insulation is damaged, it can often be easily repaired using a material called rewettable fiberglass cloth. Rewettable fiberglass cloth is a canvas-like material which is impregnated with glue. When wet it conforms to the insulation contours and thus can be placed on damaged insulation to seal off holes, tears, damage or exposed ends. When dry, the material hardens thus decreasing the potential for further damage. Insulation which is subject to regular contact or water damage should also be mechanically enclosed with an appropriate material (i.e. wood boxes or metal or plastic jackets) after repairing the damage with rewettable fiberglass cloth. Note - Duct tape is not appropriate for repair of asbestos insulation since it tends to dry out and can pull the asbestos material with it when it peels off.

Procedure for repair

1. Wear NIOSH/MSHA approved respirator and disposable clothing.

2. Thoroughly wet damaged area with a light mist of water or amended water using a spray bottle.

3. Wet a piece of rewettable fiberglass cloth thoroughly and place over damaged area, being careful to enclose any exposed insulation.

4. Clean up any asbestos debris according to procedures outlined on p. 16-2 (Steps 3 through 5).

5. Remove disposable suit and place in asbestos disposal bag. Double bag all waste and dispose according to Section 21.

6. Remove and clean respirator (Refer to Section 13).

7. When the rewettable fiberglass cloth has dried paint over the cloth with a paint which has an appropriate fire rating.

BRAKE LININGS

Asbestos exposure may occur in automotive maintenance shops during brake lining maintenance and repair. For this reason the proper safety controls should be implemented.

These include:

1) NIOSH approved respirators
2) High Efficiency Particulate Air (HEPA) Vacuum
3) Closed Brake Drum Systems

Closed Brake Drum Systems should be used in conjunction with a HEPA vacuum to prevent asbestos fibers from entering the environment. This type of system is crucial to contain asbestos fibers. Not only are employees directly working on brake linings affected by asbestos exposure but anyone who walks into the shop may be exposed if the proper safety precautions are not in place. It is recommended that NIOSH approved respirators also be worn by the worker as a backup against equipment failure and during maintenance of the HEPA vacuum system.

An enclosed cylinder is placed over the brake drum, to which a HEPA vacuum system is attached. This creates a negative air pressure within the cylinder and removes asbestos fibers. No metal brushes should be used when working on the brake drum since these cause asbestos fibers to break down to many smaller fibers. Only nylon brushes should be used. All work on the brake drum is done in the cylinder. Only when all possible work that can be done in the cylinder is complete is the cylinder removed. All airgun spraying must be done inside the cylinder.

The area being worked on should be wetted down to prevent asbestos fibers from becoming airborne. Shop vacuums should not be used because they do not capture the smaller asbestos fibers that may escape out the exhaust.

Non-Friable Material

Non-friable materials are materials which cannot be crumbled or pulverized to a powder with hand pressure. Examples include vinyl asbestos floor tile and transite board. In general non-friable materials are considered less hazardous than friable forms of asbestos, however if the proper procedures are not followed when working with these materials, asbestos fibers can be released. Note that these materials should not be cut, drilled or sanded.

If it is necessary to remove or disturb "non-friable" material, the work area should be evacuated and workers should wear NIOSH or MSHA approved respirators with HEPA filter and disposable clothing (refer to Sections 12 and 13). Nails or screws should be carefully unscrewed or dislodged using water to prevent dust formation. Water should continuously be used to wet the asbestos materials. Asbestos floor tiles should be carefully lifted from the floor without breaking them. All asbestos material must be bagged immediately and labelled (refer to Section 21 for disposal practices). Contact D.O.H. at 969-7177 before attempting any large scale abatement project involving non-friable asbestos materials. Such large scale abatement projects may warrant isolation of the work area and more extensive worker protection.

Safe Work Practices
Handling Asbestos-Containing Waste

State employees may handle asbestos-containing waste generated from incidental jobs involving quantities of less than 3 linear or square feet of asbestos. The waste generated by these jobs must be handled with the same safe work practices required for handling the asbestos before it became waste material. To prevent the release of fibers into the air, follow the procedures outlined below. Wear a NIOSH approved respirator for asbestos and protective clothing at all times while handling asbestos waste.

1. Place all waste materials including debris, protective clothing, plastic barriers and cleanup materials in six mil bags labeled with the following information:

   "DANGER - CONTAINS ASBESTOS FIBERS - AVOID CREATING DUST - CANCER AND LUNG DISEASE HAZARD"

   If the waste material is not already wet, spray it with water that has surfactant added to it before proceeding to Step 2.

2. Seal the bags to minimize the amount of void space or air in the bags and make them leak tight. Twisting and sealing with duct tape is one method for preventing leaks at the opening of the bag. Double bag the waste using another labeled bag. Seal the second bag in a leak tight manner. Note - In the case of a glovebag, use of one labeled bag with the glovebag is considered double bagging.

3. Wet wipe the exterior of the bags containing waste and place them into a drum or other rigid container equipped with secure or locking ring lids and labeled with the same information described above.

4. Place the drums or container in a secure temporary storage area previously identified at your facility. This should be an area with limited access - preferably with a locked door entrance.

5. Record the date and amount of waste placed in the temporary storage area. A log sheet should be established for this purpose.

6. Keep the temporary storage area clean using good housekeeping practices. If any bags of waste break, clean the area using the "Asbestos Debris Cleanup Procedures" outlined in section 16.

7. Before the temporary storage area is full, make arrangement to have the asbestos waste picked up and delivered to an asbestos waste disposal site:

   a. Identify a waste disposal facility which adheres to EPA's and Massachusetts Department of Environmental Quality Engineering's air quality regulations of no visible emissions during handling of the material and solid waste disposal requirements to cover the waste within 24 hours. Resources to be used in identifying such a site are:

MA Department of Environmental Quality Engineering

- Central Massachusetts	(617) 792-7653
- Northeastern Massachusetts	(617) 935-2160
- Southeastern Massachusetts	(617) 947-1231
- Western Massachusetts	(413) 785-5327

The local Board of Health

b. Make advance arrangement with the waste disposal facility to ensure that your waste will be accepted.

c. Arrange to have the asbestos waste delivered safely to the previously identified disposal facility. Use the DEQE numbers listed above for advise.

d. Obtain receipts from both the transporter and landfill for each shipment of waste and keep on file. Record all dates, destinations and responsible persons involved in getting the waste from the temporary storage area to the disposal facility.

THE HIGH EFFICIENCY PARTICULATE AIR (HEPA)

FILTERED VACUUM CLEANER

The High Efficiency Particulate Air (HEPA) Filtered Vacuum Cleaner is a specialized tool used in cleaning up small amounts of asbestos material. The HEPA vacuum cleaner is equipped with an extensive filtering system and a unique vacuum cleaner that traps ultra-fine asbestos dusts and fibers. The most important feature of the vacuum cleaner is the High Efficiency Particulate Air Filter System. These filters prevent the escape of asbestos fibers out of the vacuum cleaner and into the air.

A home or industrial shop vacuum is not equipped with these specialized features. A vacuum cleaner not equipped with HEPA filters should never be used to clean up asbestos material. In fact, use of the home or industrial shop vacuum will not only contaminate the vacuum itself, but will expose the user and area to high levels of airborne asbestos dusts, greatly increasing the health hazards.

Proper Use

Before actual use of the HEPA vacuum cleaner, make sure all of the manufacturer's preparation instructions have been followed. Familiarize yourself with any special instructions that the manufacturer has stated.

Some HEPA vacuum cleaners can not clean up wet material. Check the manufacturer's instruction manual or contact the manufacturer to find out the capabilities of the vacuum cleaner.

Some manufacturers will require you to perform light maintenance (simple filter cleaning) in between filter replacement or bag changing. Any action, which includes filter shaking, filter replacement, bag replacement or part replacement, that requires you to gain access into or take apart the vacuum cleaner should be done in the following manner. Keep in mind that the material you have vacuumed up is hazardous to human health.

Maintenance

1. Collect all necessary equipment as indicated by the manufacturer and/or this section to carry out the required maintenance or repair.

   Items you will need:

   a. Half-face re-usable respirator equipped with cartridges or filters NIOSH/MSHA approved for use with asbestos dusts.
   b. Zip-lock bag (or similar substitute) big enough to hold the respirator.
   c. Protective disposable clothing.
   d. Bucket filled with water.
   e. Sponge or rag.
   f. 6-mil polyethylene disposable bags labeled with asbestos cautions.
   g. Duct or packaging tape.

2. Place the HEPA vacuum cleaner in an outside location, away from non-authorized personnel or the interior of buildings.

3. Put on the protective disposable clothing and half-face reusable respirator with approved cartridges making sure to follow the preliminary fit test for the respirator found on page 13-1.

4. Perform the necessary maintenance or repair according to the manufacturer's instruction. Place any of the contaminated, used, or worn parts, bags, or filters into the 6-mil polyethylene disposable bag.

5. With a damp rag or sponge, clean off the interior and/or exterior of the vacuum cleaner, making sure that all visible dust is wiped up.

6. Once finished, place the sponge or rag in the 6-mil bag along with the protective disposable clothing.

7. Seal the 6-mil bag securely with duct or packaging tape, making sure there are no leaks in the bag. Place the full, sealed disposable bag into an empty 6-mil (pre-labeled) polyethylene disposable bag. Twist the top of the bag and seal with duct tape.

8. Remove respirator and place in the zip-lock bag.

9. Perform respirator cleaning and disinfecting steps outlined on page 13-3.

10. Pour the dirty water in the bucket down the sink. Flush the sink and bucket with large amounts of water.

11. Dispose of the asbestos waste according to the Guidelines presented in Section 21, "Waste - Storage/Transport/Disposal," page 21-1.

The HEPA Vacuum Cleaner is now ready for continued safe and effective use.

It is important to follow all the precautions and instructions given by the manufacturer or this section of the training manual.

If you have any questions, problems, or concerns, please contact the Division of Occupational Hygiene Asbestos Program at 969-7177 or the manufacturer of your HEPA vacuum cleaner.

PERTINENT ADDRESSES AND TELEPHONE NUMBERS

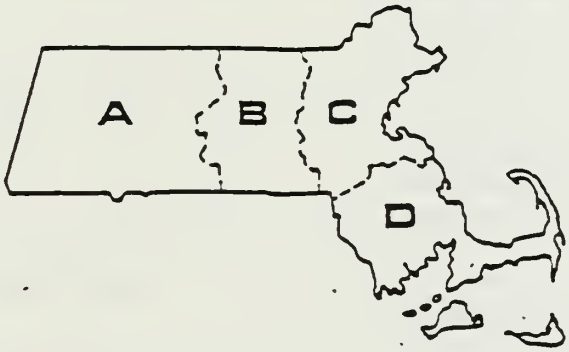
ENVIRONMENTAL PROTECTION AGENCY

Region 1 Office - JFK Federal Building
Boston, MA 02203

NESHAPS NOTIFICATION - (617) 565-3266
Attention: NESHAPS Coordinator.

TSCA NOTIFICATION - (617) 565-3273
Attention: Regional Asbestos Coordinator.

DEPARTMENT OF ENVIRONMENTAL QUALITY ENGINEERING



A. WESTERN REGIONAL OFFICE
4th Floor, State House West
436 Dwight Street, Springfield, MA 01103
Phone (413) 785-5327

B. CENTRAL REGIONAL OFFICE
75B Grove Street, Worcester, MA 01605
Phone (617) 792-7653

C. NORTHEAST REGIONAL OFFICE
5 Commonwealth Avenue, Woburn, MA 01801
Phone (617) 935-2160

D. SOUTHEAST REGIONAL OFFICE
Lakeville Hospital, Lakeville, MA 02346
Phone (617) 947-1231 ext. 680

DIVISION OF OCCUPATIONAL HYGIENE - ASBESTOS PROGRAM
1001 WATERTOWN STREET
WEST NEWTON, MA 02165
(617) 969-7177

Glossary of Terms

Abatement -	Any work done to minimize asbestos hazards including removal, encapsulation, enclosure.
Acoustical Insulation -	Insulation used for the control of sound.
Acoustical Tile -	A finishing material in a building usually found in the ceiling or walls for the purpose of noise control.
Agressive Sampling -	Air sampling using a fan, blower or broom to simulate activity. Aggressive sampling gives an air sample result which is most representative of the fiber count in an area.
Air Lock -	A system of enclosures consisting of two polyethylene curtained doorways at least three feet apart that does not permit air movement between clean and contaminated areas.
Air Monitoring -	The process of measuring the airborne fiber concentration of a specific quantity of air over a given amount of time.
Air Plenum -	Any space used to convey air in a building or structure. The space above a suspended ceiling is often used as an air plenum.
Air Sample -	Sample of air taken for the purpose of determining a quantity of material found in the air.
Alveoli -	Located in clusters around the respiratory bronchioles of the lungs, this is the area in which true respiration takes place.
Ambient Air -	The surrounding air or atmosphere in a given area under normal conditions.
Amended Water -	Water to which a chemical wetting agent (surfactant) has been added to improve penetration into asbestos-containing materials that are being removed.
ANSI -	American National Standards Institute
Approved Landfill -	A site for the disposal of asbestos-containing and other hazardous wastes that has been given EPA approval.
Aspect Ratio -	The length of a fiber vs. its width.
Asbestiform -	Fibrous minerals which, due to their crystal structures and chemical composition, can be classified as a form of asbestos.

Asbestos -	A generic name given to a number of naturally occurring hydrated mineral silicates that possess a unique crystalline structure, are incombustible in air, and are separable into fibers. Asbestos includes the asbestiform varieties of chrysotile (serpentine); crocidolite (riebeckite); amosite (cummingtonite-grunerite); anthophyllite; and actinolite.
Asbestos Abatement -	Procedures to control fiber release from asbestos-containing materials in buildings.
Asbestos Control -	Minimizing the generation of airborne asbestos fibers until a permanent solution is developed.
Asbestos Exposure - Assessment System	A decision tool which can be used to determine the extent of the asbestos hazard that exists in a building, and which can also be used to develop corrective actions.
Asbestos Fibers -	Fibers greater than 5 microns long and a length to width ratio of at least 3:1, generated from an asbestos-containing material.
Asbestos Standard -	Refers to the OSHA requirements in the general industry standards regarding asbestos exposure (29 CFR 1910.1001), and EPA National Emission Standard for Hazardous Air Pollutants (NESHAP) (40 CFR 61, subpart M) or Asbestos Abatement Projects (40 CFR Part 763) applicable for public employees.
Asbestosis -	A non-malignant, progressive, irreversible lung disease caused by the inhalation of asbestos dust and characterized by diffuse fibrosis. This disease is usually occurs after high level exposures.
Atmospheres - Immediately Dangerous to Life or Health	A hazardous atmosphere to which exposure will result in serious injury or death in a matter of minutes, or cause serious delayed effects.
Atmosphere Supplying - Respirators	Respiratory protection devices which exclude work-place air altogether and provide clean air from some independent source.
Bid -	A statement of the price at which a contractor will complete a given project.
Bid Specifications -	A detailed description of how a job (i.e., asbestos removal) is to be done.
Bronchi -	Primary branches of the trachea (windpipe).

Bulk Sample -	Physical sample of the material (i.e., piece of covering or ceiling material). This is in contrast to an air sample where the air itself is sampled for fibers. Bulk samples are taken to determine if a material contains asbestos.
Chrysotile (white asbestos) -	The only asbestiform mineral of the serpentine variety which contains approximately 40% each of silica and magnesium oxide. It is the most common form of asbestos used in buildings.
Cilia -	Tiny hair-like structures in the windpipe and bronchi of the lung passages that help force undesirable particles and liquids up and out of the lungs.
Cancer -	A cellular tumor which normally leads to premature death of is host unless controlled.
Ceiling Concentration -	The maximum allowable level of toxic material that can be present at any given point in time.
Cementitious -	Asbestos-containing material that are densely packed, granular and cement-like in nature.
CFM -	Cubic feet per minute
Clean Area -	The first stage of the decontamination enclosure system in which workers prepare to enter the work area.
Closed Circuit SCBA -	A self-contained respiratory protection device in which the air is rebreathed after the exhaled carbon dioxide has been removed and the oxygen content restored.
Contract Specifications -	A set of guidelines that a contractor must follow when conducting an asbestos abatement job.
CPSC -	Consumer Product Safety Commission (Federal Agency)
Decontamination Enclosure System -	A series of connected rooms with polyethylene curtained doorways for the purpose of preventing contamination of area adjacent to the work area.
DEQE -	Department of Environmental Quality Engineering (State Agency)
Dirty Area -	Any area in which the concentration of airborne asbestos fibers exceeds 0.01 f/cc, or where there is visible asbestos residue.
Dispersion Staining -	Coloration added to asbestos samples for the purpose of making the sample more visible and easier to identify.

DOH -	Division of Occupational Hygiene (State Agency)
Duct Tape -	Heavy gauge tape capable of sealing joints or adjacent sheets of polyethylene.
Dust Mask -	Single use or disposable dust respirator with a low protection factor. Not generally recommended for use with asbestos.
Electron Microscopy -	A method of asbestos sample analysis which utilizes an electron beam to differentiate between fibers.
Encapsulation -	The coating of asbestos-containing material with a bonding or sealing agent to prevent the release of airborne fibers.
Encapsulant (sealant) -	A substance applied to asbestos-containing material which controls the release of airborne asbestos-fibers.
EPA -	Environmental Protection Agency (Federal Agency)
Epidemiology -	The study of occurrence and distribution of disease throughout a population.
Equipment Room -	The last stage or room of the worker decontamination system before entering the work area.
F/CC -	Fibers per cubic centimeters of air (a cubic centimeter is about the size of a sugar cube).
Fiber Containment -	Enclosing or sealing off an area having airborne asbestos fibers present so that the fibers will not migrate resulting in contamination of other areas.
Fiber Control -	Minimizing the amount of airborne fiber generation through the application of amended water onto asbestos-containing material, or enclosure (isolation) of the material.
Fibrosis -	Composed almost entirely of fibers.
Fireproofing -	Spray- or trowel-applied fire resistant materials.
Friable Asbestos -	Any materials that contain more than 1% asbestos by weight and can be crumbled, pulverized, or reduced to powder by hand pressure (i.e., asbestos pipe coverings, boiler casings, I-beam spray-on).
Full Facepiece - Respirator	A respirator which covers the wearer's entire face from the hairline to below the chin.

Glovebag -	Plastic bag-type enclosure placed around asbestos-containing pipe lagging so that it may be removed without generating airborne fibers into the atmosphere.
Ground Fault Interrupter -	A device which automatically de-energizes any high voltage system component which has developed a fault in the ground line.
Half Mask Respirator with High Efficiency Filters -	A respirator which covers one-half of the wearer's face and is equipped with filters capable of screening out 99.97% of all particles larger than 0.3 microns.
Heat Cramps -	Painful spasms of heavily used skeletal muscles such as hands, arms, legs, and abdomen which are sometimes accompanied by dilated pupils and weak pulse resulting from depletion of the salt content of the body.
Heat Exhaustion -	A condition resulting from dehydration and/or salt depletion, or lack of blood circulation which is usually accompanied by fatigue, nausea, headache, giddiness, clammy skin, and a pale appearance.
Heat Stress -	A bodily disorder associated with exposure to excessive heat.
Heat Stroke -	The most severe of the heat stress disorders resulting from the loss of the body's ability to sweat which is characterized by hot dry skin, dizziness, nausea, severe headache, confusion, delerium, loss of consciousness, convulsion, and coma.
HEPA -	High Efficiency Particulate Air (Air Filter)
HEPA Filtered Vacuum -	A high efficiency particulate air (HEPA) filtered vacuum capable of trapping and retaining 99.97% of all particles larger than 0.3 microns.
HVAC System -	Heating, Ventilation, and Air Conditioning system usually found in large business and industry facilities.
Industrial Hygienist -	A professional qualified by education, training, and experience to recognize, evaluate, and develop controls for occupational health hazards.
Local Exhaust Ventilation -	The mechanical removal of air contaminants from a point of operation.
Lung Cancer -	An uncontrolled growth of abnormal cells in the lungs which normally results in the death of the host.

Macrophage -	A type of cell which engulfs and digests cells or foreign objects.
Make-up Air -	Supplied or recirculated air to offset that which has already been exhausted from an area.
Mesothelioma -	A relatively rare form of cancer which develops in the lining of the pleura or peritoneum with no known cure.
Method 7400 -	NIOSH sampling and analytical method for fibers using phase-contrast microscopy. Replaces P&CAM 239 Method.
Micron -	One millionth of a meter
Mil -	Prefix meaning one-thousandth
Millimeter -	One-thousandth of a meter
Mineral Wool -	A commonly used substitute for asbestos.
MSDS -	Material Safety Data Sheet
MSHA -	Mine Safety and Health Administration
Negative Pressure -	An atmosphere created in a work area enclosure such that airborne fibers will tend to be drawn through the filtration system rather than leak out into the surrounding areas. The air pressure inside the work area is less than that outside the work area.
NESHAP -	National Emission Standards for Hazardous Air Pollutants -- EPA Regulation 40 CFR subpart M, part 61.
NIOSH -	The National Institute for Occupational Safety and Health which was established by the Occupational Safety and Health Act of 1970.
NIOSH/MSHA -	The official approving agencies for respiratory protective who test and certify respirators.
Non-friable Asbestos -	Materials which contain mostly binder and do not generate dust under normal conditions. Note - non-friable materials can become friable if cut, ground, sanded, etc. (i.e., floor tiles).
Operations and Maintenance Plan -	Specific procedures and practices developed for the interim control of asbestos-containing materials in buildings until it is removed.
OSHA -	The Occupational Safety and Health Administration which was created by the Occupational Safety and Health Act of 1970; serves as the enforcement agency for safety and health in the workplace environment.

Oxygen Deficient - Atmosphere	Any atmosphere containing less than 19.5% oxygen.
P&CAM 239 -	A NIOSH sampling and analytical method for measuring airborne fibers using phase-contrast microscopy.
PEL -	Permissible Exposure Limit as stated by OSHA. Refers to the maximum level of exposure allowed according to the regulation.
Penetrating - Encapsulant	Liquid material applied to asbestos-containing material to control airborne fiber release by penetrating into the material and binding its components together.
Peritoneum -	The thin membrane that lines the surfaces of the abdominal cavity.
Personal Sample -	An air sample taken with the sampling pump directly attached to the worker with the collecting filter placed in the worker's breathing zone.
PF -	Protection factor as provided by a respirator which is determined by dividing the airborne fiber concentration outside of the mask by the concentration inside the mask.
Phase Contrast - Microscopy (PCM)	An optical microscopic technique used for the counting of fibers in air samples, but which does not distinguish fiber types.
Pipe Lagging -	The insulation or wrapping around a pipe.
Pleura -	The thin membrane surrounding the lungs, and which lines the internal surface of the chest cavity.
Pneumoconiosis -	A condition in the lungs which is a result of having inhaled various dusts and particles for a prolonged period of time.
Polarized Light - Microscopy (PLM)	An optical microscopic technique used to distinguish between different types of asbestos fibers by their shape and unique optical properties.
Polyethylene -	Plastic sheeting which is often used to seal off an area in which asbestos removal is taking place for the purpose of preventing contamination of other areas.
Powered Air Purifying - Respirator (PAPR)	Either a full facepiece, helmet, or hooded respirator that has the breathing air powered to the wearer after it has been purified through a filter.

Protective Clothing -	Protective, lightweight garments worn by workers performing asbestos abatement to keep gross contamination off the body.
Protective Equipment -	Usually refers to respirators and disposable clothing.
Pulmonary -	Pertaining to, or effecting the lungs, or some portion thereof.
Pulmonary Function Tests -	A part of the medical examination required to determine the health status of a person's lungs.
Random Sample -	A sample drawn in such a way that there is no set pattern and is designed to give a true representation of the entire population or area.
Respirable -	Breathable
Respirator Program -	A written program established by an employer which provides for the safe use of respirators on their job sites.
Rewettable Fiberglass -	Canvas-like material impregnated with glue. This material is wet and molded over asbestos insulation. It hardens when dry and can be painted over with a latex paint.
Risk -	The likelihood or probability of developing a disease, or being hurt, as the result of exposure to a contaminant or a condition.
Scanning Electron Microscopy (SEM) -	A method of microscopic analysis which utilizes an electron beam directed at the sample and then collects the beams that are reflected to produce an image from which fibers can be identified and counted.
Scanning Transmission Electron Microscopy (STEM) -	A combination of a transmission electron microscopy with scanning and focusing coils so that a beam of electrons can be scanned over the sample or pinpointed in a particular area.
SCBA -	Self-Contained Breathing Apparatus
Shower Room -	A room between the clean room and the equipment room in a worker decontamination system in which workers take showers when leaving the work area.
Supplied Air Respirator -	A respirator that has a central source of breathing air which is supplied to the wearer by way of an airline.
Surfactant -	A chemical wetting agent added to water to improve its penetration abilities into asbestos-containing materials.

TLV - (Threshold Limit Value)	Levels of contaminants established by the American Conference of Governmental Industrial Hygienists to which it is believed that workers can be exposed to with minimal adverse health effects.
Transmission Electron - Microscopy (TEM)	A method of microscopic analysis which utilizes an electron beam that is focused onto a thin sample. As the beam penetrates (transmits) through the sample, the difference in densities produces an image on a fluorescent screen from which samples can be identified and counted.
TSCA -	Toxic Substances Control Act which includes a regulation regarding public employees involved in asbestos abatement work.
TWA -	Time-Weighted Average, as in air sampling.
Type C Supplied - Air Respirator	A respirator designed to provide a very high level of protection which supplies air to the wearer from an outside source such as a compressor.
USEPA -	United States Environmental Protection Agency
Vermiculite -	A micaceous mineral that is sometimes used as a substitute for asbestos which is lightweight and highly water-absorbent.

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Material Safety Data Sheet for Asbestos

Appendix A

MATERIAL SAFETY DATA SHEET

The Commonwealth of Massachusetts
Department of Labor and Industries
Division of Occupational Hygiene
1001 Watertown Street
West Newton 02165
(617) 969-7178

Substance: ASBESTOS

Date Compiled/Revised 9/86

SECTION I ********** SUBSTANCE IDENTIFICATION **********

Substance name: Asbestos
CAS #: 1332-21-4
Types of asbestos: actinolite (CAS #: 77536-66-4)
amosite (grunerite) (CAS #: 12172-73-5)
anthophylite (CAS #: 77536-67-5)
chrysotile (CAS #: 12001-29-5)
crocidolite (CAS #: 12001-28-4)
tremolite (CAS #: 77536-68-6)

Although individual types of asbestos have different CAS numbers, the appropriate CAS number for the generic group "asbestos" is 1332-21-4.

SECTION II ********** PHYSICAL DATA **********

Appearance: Fine, slender, flaxy fibers which may be white, green, blue, or gray-brown in color. The fibers may be incorporated into other materials that do not have the same appearance or properties as asbestos.

Other Properties: Resistant to heat, chemically inert, insoluble in water and other solvents, and easily crumbles into small fibers which may become airborne and inhaled. Asbestos cannot be positively identified without microscopic analysis.

SECTION III ********** HEALTH HAZARD INFORMATION **********

Routes of exposure

The primary route of exposure is inhalation. Ingestion of asbestos fibers has also been associated with cancer of the gastrointestinal tract; however, the connection has only been weakly supported by animal studies.

Acute (Short-term) Health Effects

In general, asbestos has no unique short-term health effects beyond those attributed to nuisance dusts, namely irritation of the eyes, nose, and throat. The toxic effects of asbestos take many years to develop and are therefore considered long-term health effects. Asbestos-related diseases can develop many years after exposure to asbestos has ceased.

SECTION III ********** HEALTH HAZARD INFORMATION (cont.) **********

Chronic (Long-term) Health Effects

1) Cancerous Effects:

Inhalation of asbestos fibers can cause LUNG CANCER and MESOTHELIOMA (cancer of the chest cavity linings). Lung cancer and Mesothelioma are almost always fatal. Some studies suggest that asbestos may cause cancer of the larynx, gastrointestinal tract, and other sites as well. The lag time between exposure to asbestos and the onset of cancer is usually between 15 and 40 years. Statistically, the risk of cancer increases with increasing degree of asbestos exposure, however, very low exposure levels have not been proven safe.

There is a multiplicative effect of cigarette smoking and asbestos exposure on increasing the risk of developing lung cancer; therefore, on average, asbestos is more hazardous to individuals who smoke than to those who do not smoke.

2) Non-cancerous Effects:

Inhalation of moderate to high levels of asbestos fibers over a long period of time can cause ASBESTOSIS, a progressive, irreversible, potentially fatal lung disease, characterized by scarring of the lung tissue. Symptoms include breathlessness on exertion, non-productive coughing, and other breathing difficulties. Those symptoms usually do not appear until after the disease process is well underway. Most often, asbestos-related lung abnormalities can be detected prior to the appearance of symptoms by X-rays, and sometimes by breathing tests. Individuals who have previously been exposed to significant levels of asbestos should seek medical attention whether or not symptoms are apparent.

Brief, intense exposure to asbestos through inhalation can also cause scarring of the lining of lungs known as ASBESTOS-RELATED PLEURAL DISEASE. Usually, the scarring is not extensive, has no effect on lung function, and does not cause symptoms; however, on rare occasion, this scarring is very extensive and can cause breathing impairment.

Occupational Exposure Limits:

OSHA Standard
Average 8-hour exposure, all types of asbestos.....0.2 fibers/cc air
NIOSH Recommended Limit
Average 8-hour exposure, all types of asbestos.....0.1 fiber /cc air
ACGIH Recommended Limit
Average 8-hour exposure, chrysotile. . . . . .2.0 fibers/cc
amosite . . . . . .0.5 fiber /cc
crocidolite . . . . . .0.2 fiber /cc
other forms . . . . . .2.0 fibers/cc

SECTION III ********** HEALTH HAZARD INFORMATION (cont.) **********

The only legally-enforceable standard is the OSHA Standard. The other limits are officially-recommended exposure limits. Irrespective of these established or recommended exposure limits, prudent personal protection during any asbestos-related job, however small, should at least include the use of a respirator approved by NIOSH for asbestos.

Disposable paper dust masks are not recommended for any asbestos-related work because they do not form a tight seal around the mouth and nose.

SECTION IV ********** EMERGENCY and FIRST AID INFORMATION **********

Since the acute, or short-term, effects of asbestos are essentially the same as those of other dusts, namely, drying and irritation of the eyes, nose and throat, forseeable emergency or first aid procedures would be limited to flushing of the eyes with water if contaminated with large amounts of asbestos dust. Furthermore, in instances of gross bodily contamination, the victim should take proper personal hygiene measures for the purpose of minimizing the risk of long term health effects, e.g. remove and launder clothing, shower, etc. Care should be taken to avoid breathing asbestos dust.

SECTION V ********** PROTECTIVE MEASURES **********

Any asbestos-related work should be done in such a way as to minimize the generation, dispersion, and inhalation of asbestos fibers. Personal protective equipment consists of a respirator (face mask) approved for asbestos by NIOSH, and a disposable jumpsuit. Proper work practices include wetting of the asbestos material being worked on, 'misting' dusty areas with a fine water spray, mopping or wet-vacuuming when cleaning debris, showers for decontaminating workers, localized or complete-area containment with polyethylene sheeting for the purpose of preventing fiber dispersion into clean areas, and local exhaust ventilation.

The extent to which the above methods must be utilized depends on the degree to which asbestos materials will be disturbed. Even the smallest jobs, however, should not be performed without the use of NIOSH-approved respiratory protection equipment.

SECTION VI ********** FIRE and EXPLOSION INFORMATION **********

Asbestos is not flammable and not explosive. In a fire situation, firefighters should be aware of possible asbestos exposure hazard in buildings with structural damage to asbestos insulation, and proper respirators should be used where necessary.

SECTION VII ********** STORAGE and REACTIVITY INFORMATION **********

Asbestos is chemically stable and non-reactive. Proper storage methods are those which prevent the generation and dispersion of airborne fibers. Asbestos raw materials and wastes should be stored, preferrably in a wet state, in heavy plastic bags, drums, or similar containers, and tightly sealed.

Asbestos-containing pipe or boiler insulation should be maintained in a well-repaired condition (patched and painted) so that fibers cannot be released into the air.

SECTION VIII ******** SPILL, LEAK and DISPOSAL PROCEDURES **********

Clean-up of asbestos debris should be done using wet methods, i.e. sponging or mopping. There should be no dry-sweeping or vacuuming, unless a vacuum equipped with a high efficiency particulate air (HEPA) filter is used. Workers should wear respirators approved for asbestos by NIOSH. Depending on the amount of asbestos debris to be cleaned up, more elaborate safety measures may be necessary, for example, use of disposable jumpsuits, polyethylene containment barriers, etc. (See SECTION V, Protective Measures).

Debris should be bagged in a wet state in heavy plastic bags, and disposed of in a landfill approved for asbestos waste.

SECTION IX ********** ADDITIONAL INFORMATION **********

Asbestos is used in a variety of products where a fibrous material resistant to heat or chemicals is needed. Long fibers are used in making textiles, such as cloth, braid, rope and theatre curtains. The shorter fibers, combined with an agglomerating agent, are used in the manufacture of cardboard, cements, covering and insulating agents, felt, paper, tires, brake linings and many other products.

Any work to be done on materials suspected of containing asbestos should not proceed unless necessary precautions are taken, or unless laboratory analysis of the material indicates that no asbestos is present. Many materials, such as floor tiles and roofing shingles, may contain a large amount of asbestos, but do not constitute an exposure hazard unless dust is generated by sanding, scraping, etc. The mere presence of asbestos does not constitute a hazard--a hazard exists only when airborne fibers are generated.

OSHA recently issued new workplace standards that lower the permissible exposure limit by tenfold. The standards, one for general industry and one for construction, contain very specific requirements for employers to protect their employees from exposure to asbestos. Please see the Federal Register, June 20, 1986 for full details or call the nearest area OSHA office for a copy of the standard. Waltham OSHA office: (617) 647-8681
Springfield OSHA office: (413) 785-0123

For more information:

Contact the Industrial Hygienist or Safety Officer at your worksite, or the Asbestos Program of the Massachusetts Division of Occupational Hygiene,
1001 Watertown Street,
West Newton, MA 02165. Telephone (617) 969-7178.

Regulations

Appendix B

USEPA NESHAPS Standard

USEPA National Emission Standards for Hazardous Air Pollutants (NESHAPS) Asbestos Regulations (40 CFR 61, Subpart M)

AUTHORITY: Secs. 112 and 301(a) of the Clean Air Act, as amended (42 U.S.C. 7412, 7601(a)).

SOURCE: 49 FR 13661, Apr. 5, 1984, unless otherwise noted.

§ 61.140 Applicability.

The provisions of this subpart are applicable to those sources specified in §§ 61.142 through 61.153.

§ 61.141 Definitions.

All terms that are used in this subpart and are not defined below are given the same meaning as in the Act and in Subpart A of this part.

Active waste disposal site means any disposal site other than an inactive site.

Adequately wetted means sufficiently mixed or coated with water or an aqueous solution to prevent dust emissions.

Asbestos means the asbestiform varieties of serpentinite (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite, anthophyllite, and actinolite-tremolite.

Asbestos-containing waste materials means any waste that contains commercial asbestos and is generated by a source subject to the provisions of this subpart. This term includes asbestos mill tailings, asbestos waste from control devices, friable asbestos waste material, and bags or containers that previously contained commercial asbestos. However, as applied to demolition and renovation operations, this term includes only friable asbestos waste and asbestos waste from control devices.

Asbestos material means asbestos or any material containing asbestos.

Asbestos mill means any facility engaged in converting, or in any intermediate step in converting, asbestos ore into commercial asbestos. Outside storage of asbestos material is not considered a part of the asbestos mill.

Asbestos tailings means any solid waste that contains asbestos and is a product of asbestos mining or milling operations.

Asbestos waste from control devices means any waste material that contains asbestos and is collected by a pollution control device.

Commercial asbestos means any asbestos that is extracted from asbestos ore.

Demolition means the wrecking or taking out of any load-supporting structural member of a facility together with any related handling operations.

Emergency renovation operation means a renovation operation that was not planned but results from a sudden, unexpected event. This term includes operations necessitated by nonroutine failures of equipment.

Fabricating means any processing of a manufactured product that contains commercial asbestos, with the exception of processing at temporary sites for the construction or restoration of facilities.

Facility means any institutional, commercial, or industrial structure, installation, or building (excluding apartment buildings having no more than four dwelling units).

Facility component means any pipe, duct, boiler, tank, reactor, turbine, or furnace at or in a facility; or any structural member of a facility.

Friable asbestos material means any material containing more than 1 percent asbestos by weight that hand pressure can crumble, pulverize, or reduce to powder when dry.

Inactive waste disposal site means any disposal site or portion of it where additional asbestos-containing waste material will not be deposited and where the surface is not disturbed by vehicular traffic.

Manufacturing means the combining of commercial asbestos—or, in the case of woven friction products, the combining of textiles containing commercial asbestos—with any other material(s), including commercial asbestos, and the processing of this combination into a product.

Outside air means the air outside buildings and structures.

Particulate asbestos material means finely divided particles of asbestos material.

Planned renovation operations means a renovation operation, or a number of such operations, in which the amount of friable asbestos material that will be removed or stripped within a given period of time can be predicted. Individual nonscheduled operations are included if a number of such operations can be predicted to occur during a given period of time based on operating experience.

Remove means to take out friable asbestos materials from any facility.

Renovation means altering in any way one or more facility components. Operations in which load-supporting structural members are wrecked or taken out are excluded.

Roadways means surfaces on which motor vehicles travel. This term includes highways, roads, streets, parking areas, and driveways.

Strip means to take off friable asbestos materials from any part of a facility.

Structural member means any load-supporting member of a facility, such as beams and load supporting walls; or any nonload-supporting member, such as ceilings and nonload-supporting walls.

Visible emissions means any emissions containing particulate asbestos material that are visually detectable without the aid of instruments. This does not include condensed uncombined water vapor.

[49 FR 13661, Apr. 5, 1984; 49 FR 25453, June 21, 1984]

§ 61.142 Standard for asbestos mills.

Each owner or operator of an asbestos mill shall either discharge no visible emissions to the outside air from that asbestos mill or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.

§ 61.143 Standard for roadways.

No person may surface a roadway with asbestos tailings or asbestos-containing waste material on that roadway, unless it is a temporary roadway on an area of asbestos ore deposits.

[49 FR 13661, Apr. 5, 1984; 49 FR 25453, June 21, 1984]

§ 61.144 Standard for manufacturing.

(a) *Applicability.* This section applies to the following manufacturing operations using commercial asbestos.

(1) The manufacture of cloth, cord, wicks, tubing, tape, twine, rope, thread, yarn, roving, lap, or other textile materials.

(2) The manufacture of cement products.

(3) The manufacture of fireproofing and insulating materials.

(4) The manufacture of friction products.

(5) The manufacture of paper, millboard, and felt.

(6) The manufacture of floor tile.

(7) The manufacture of paints, coatings, caulks, adhesives, and sealants.

(8) The manufacture of plastics and rubber materials.

(9) The manufacture of chlorine.

(10) The manufacture of shotgun shell wads.

(11) The manufacture of asphalt concrete.

(b) *Standard.* Each owner or operator of any of the manufacturing operations to which this section applies shall either:

(1) Discharge no visible emissions to the outside air from these operations or from any building or structure in which they are conducted; or

(2) Use the methods specified by § 61.154 to clean emissions from these operations containing particulate asbestos material before they escape to, or are vented to, the outside air.

§ 61.145 Standard for demolition and renovation: Applicability.

The requirements of §§ 61.146 and 61.147 apply to each owner or operator

of a demolition or renovation operation as follows:

(a) If the amount of friable asbestos materials in a facility being demolished is at least 80 linear meters (260 linear feet) on pipes or at least 15 square meters (160 square feet) on other facility components, all the requirements of §§ 61.146 and 61.147 apply, except as provided in paragraph (c) of this section.

(b) If the amount of friable asbestos materials in a facility being demolished is less than 80 linear meters (260 linear feet) on pipes and less than 15 square meters (160 square feet) on other facility components, only the requirements of paragraphs (a), (b), and (c) (1), (2), (3), (4), and (5) of § 61.146 apply.

(c) If the facility is being demolished under an order of a State or local governmental agency, issued because the facility is structurally unsound and in danger of imminent collapse, only the requirements in § 61.146 and in paragraphs (d), (e), (f), and (g) of § 61.147 apply.

(d) If at least 80 linear meters (260 linear feet) of friable asbestos materials on pipes or at least 15 square meters (160 square feet) of friable asbestos materials on other facility components are stripped or removed at a facility being renovated, all the requirements of §§ 61.146 and 61.147 apply.

(1) To determine whether paragraph (d) of this section applies to planned renovation operations involving individual nonscheduled operations, predict the additive amount of friable asbestos materials to be removed or stripped over the maximum period of time a prediction can be made, not to exceed 1 year.

(2) To determine whether paragraph (d) of this section applies to emergency renovation operations, estimate the amount of friable asbestos materials to be removed or stripped as a result of the sudden, unexpected event that necessitated the renovation.

(e) Owners or operators of demolition and renovation operations are exempt from the requirements of §§ 61.05(a), 61.07, and 61.09.

[49 FR 13661, Apr. 5, 1984; 49 FR 25453, June 21, 1984]

§ 61.146 Standard for demolition and renovation: Notification requirements.

Each owner or operator to which this section applies shall:

(a) Provide the Administrator with written notice of intention to demolish or renovate.

(b) Postmark or deliver the notice as follows:

(1) At least 10 days before demolition begins if the operation is described in § 61.145(a);

(2) At least 20 days before demolition begins if the operation is described in § 61.145(b);

(3) As early as possible before demolition begins if the operation is described in § 61.145(c);

(4) As early as possible before renovation begins.

(c) Include the following information in the notice:

(1) Name and address of owner or operator.

(2) Description of the facility being demolished or renovated, including the size, age, and prior use of the facility.

(3) Estimate of the approximate amount of friable asbestos material present in the facility in terms of linear feet of pipe, and surface area on other facility components. For facilities described in § 61.145(b), explain techniques of estimation.

(4) Location of the facility being demolished or renovated.

(5) Scheduled starting and completion dates of demolition or renovation.

(6) Nature of planned demolition or renovation and method(s) to be used.

(7) Procedures to be used to comply with the requirements of this Subpart.

(8) Name and location of the waste disposal site where the friable asbestos waste material will be deposited.

(9) For facilities described in § 61.145(c), the name, title, and authority of the State or local governmental representative who has ordered the demolition.

(Approved by the Office of Management and Budget under control number 2000-0264.)

[49 FR 13661, Apr. 5, 1984; 49 FR 25453, June 21, 1984]

§ 61.147 Standard for demolition and renovation: Procedures for asbestos emission control.

Each owner or operator to whom this section applies shall comply with the following procedures to prevent emissions of particulate asbestos material to the outside air:

(a) Remove friable asbestos materials from a facility being demolished or renovated before any wrecking or dismantling that would break up the materials or preclude access to the materials for subsequent removal. However, friable asbestos materials need not be removed before demolition if:

(1) They are on a facility component that is encased in concrete or other similar material; and

(2) These materials are adequately wetted whenever exposed during demolition.

(b) When a facility component covered or coated with friable asbestos materials is being taken out of the facility as units or in sections:

(1) Adequately wet any friable asbestos materials exposed during cutting or disjointing operations; and

(2) Carefully lower the units or sections to ground level, not dropping them or throwing them.

(c) Adequately wet friable asbestos materials when they are being stripped from facility components before the members are removed from the facility. In renovation operations, wetting that would unavoidably damage equipment is not required if the owner or operator:

(1) Asks the Administrator to determine whether wetting to comply with this paragraph would unavoidably damage equipment, and, before beginning to strip, supplies the Administrator with adequate information to make this determination; and

(2) When the Administrator does determine that equipment damage would be unavoidable, uses a local exhaust ventilation and collection system designed and operated to capture the particulate asbestos material produced by the stripping and removal of the friable asbestos materials. The system must exhibit no visible emissions to the outside air or be designed and operated in accordance with the requirements in § 61.154.

(d) After a facility component has been taken out of the facility as units or in sections, either:

(1) Adequately wet friable asbestos materials during stripping; or

(2) Use a local exhaust ventilation and collection system designed and operated to capture the particulate asbestos material produced by the stripping. The system must exhibit no visible emissions to the outside air or be designed and operated in accordance with the requirements in § 61.154.

(e) For friable asbestos materials that have been removed or stripped:

(1) Adequately wet the materials to ensure that they remain wet until they are collected for disposal in accordance with § 61.152; and

(2) Carefully lower the materials to the ground or a lower floor, not dropping or throwing them; and

(3) Transport the materials to the ground via dust-tight chutes or containers if they have been removed or stripped more than 50 feet above ground level and were not removed as units or in sections.

(f) When the temperature at the point of wetting is below 0°C (32°F):

(1) Comply with the requirements of paragraphs (d) and (e) of this section. The owner or operator need not comply with the other wetting requirements in this section; and

(2) Remove facility components coated or covered with friable asbestos materials as units or in sections to the maximum extent possible.

(g) For facilities described in § 61.145(c), adequately wet the portion of the facility that contains friable asbestos materials during the wrecking operation.

§ 61.148 Standard for spraying.

The owner or operator of an operation in which asbestos-containing materials are spray applied shall comply with the following requirements:

(a) Use materials that contain 1 percent asbestos or less on a dry weight basis for spray-on application on buildings, structures, pipes, and conduits, except as provided in paragraph (c) of this section.

(b) For spray-on application of materials that contain more than 1 percent

asbestos on a dry weight basis on equipment and machinery, except as provided in paragraph (c) of this section:

(1) Notify the Administrator at least 20 days before beginning the spraying operation. Include the following information in the notice:

(i) Name and address of owner or operator.

(ii) Location of spraying operation.

(iii) Procedures to be followed to meet the requirements of this paragraph.

(2) Discharge no visible emissions to the outside air from the spray-on application of the asbestos-containing material or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.

(c) The requirements of paragraphs (a) and (b) of this section do not apply to the spray-on application of materials where the asbestos fibers in the materials are encapsulated with a bituminous or resinous binder during spraying and the materials are not friable after drying.

(d) Owners and operators of sources subject to this section are exempt from the requirements of §§ 61.05(a), 61.07, and 61.09.

(Approved by the Office of Management and Budget under control number 2000-0264.)

§ 61.149 Standard for fabricating.

(a) *Applicability.* This section applies to the following fabricating operations using commercial asbestos:

(1) The fabrication of cement building products.

(2) The fabrication of friction products, except those operations that primarily install asbestos friction materials on motor vehicles.

(3) The fabrication of cement or silicate board for ventilation hoods; ovens; electrical panels; laboratory furniture, bulkheads, partitions, and ceilings for marine construction; and flow control devices for the molten metal industry.

(b) *Standard.* Each owner or operator of any of the fabricating operations to which this section applies shall either:

(1) Discharge no visible emissions to the outside air from any of the operations or from any building or structure in which they are conducted; or

(2) Use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.

§ 61.150 Standard for insulating materials.

After the effective date of this regulation, no owner or operator of a facility may install or reinstall on a facility component any insulating materials that contain commercial asbestos if the materials are either molded and friable or wet-applied and friable after drying. The provisions of this paragraph do not apply to spray-applied insulating materials regulated under § 61.148.

§ 61.151 Standard for waste disposal for asbestos mills.

Each owner or operator of any source covered under the provisions of § 61.142 shall:

(a) Deposit all asbestos-containing waste material at waste disposal sites operated in accordance with the provisions of § 61.156; and

(b) Discharge no visible emissions to the outside air from the transfer of asbestos waste from control devices to the tailings conveyor, or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air. Dispose of the asbestos waste from control devices in accordance with § 61.152(b) or paragraph (c) of this section; and

(c) Discharge no visible emissions to the outside air during the collection, processing, packaging, transporting, or deposition of any asbestos-containing waste material, or use one of the disposal methods specified in paragraphs (c) (1) or (2) of this section, as follows:

(1) Use a wetting agent as follows:

(i) Adequately mix all asbestos-containing waste material with a wetting agent recommended by the manufacturer of the agent to effectively wet dust and tailings, before depositing the material at a waste disposal site. Use the agent as recommended for the

particular dust by the manufacturer of the agent.

(ii) Discharge no visible emissions to the outside air from the wetting operation or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.

(iii) Wetting may be suspended when the ambient temperature at the waste disposal site is less than −9.5°C (15°F). Determine the ambient air temperature by an appropriate measurement method with an accuracy of ±1°C(±2°F), and record it at least hourly while the wetting operation is suspended. Keep the records for at least 2 years in a form suitable for inspection.

(2) Use an alternative disposal method that has received prior approval by the Administrator.

§ 61.152 Standard for waste disposal for manufacturing demolition, renovation, spraying, and fabricating operations.

Each owner or operator of any source covered under the provisions of §§ 61.144 and 61.149 shall:

(a) Deposit all asbestos-containing waste material at waste disposal sites operated in accordance with the provisions of § 61.156; and

(b) Discharge no visible emissions to the outside air during the collection, processing (including incineration), packaging, transporting, or deposition of any asbestos-containing waste material generated by the source, or use one of the disposal methods specified in paragraphs (b)(1), (2), or (3) of this section, as follows:

(1) Treat asbestos-containing waste material with water:

(i) Mix asbestos waste from control devices with water to form a slurry; adequately wet other asbestos-containing waste material; and

(ii) Discharge no visible emissions to the outside air from collection, mixing, and wetting operations, or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air; and

(iii) After wetting, seal all asbestos-containing waste material in leak-tight containers while wet; and

(iv) Label the containers specified in paragraph (b)(1)(iii) as follows:

CAUTION

Contains Asbestos-
Avoid Opening or
Breaking Container
Breathing Asbestos is Hazardous
to Your Health

Alternatively, use warning labels specified by Occupational Safety and Health Standards of the Department of Labor, Occupational Safety and Health Administration (OSHA) under 29 CFR 1910.1001(g)(2)(ii).

(2) Process asbestos-containing waste material into nonfriable forms:

(i) Form all asbestos-containing waste material into nonfriable pellets or other shapes; and

(ii) Discharge no visible emissions to the outside air from collection and processing operations, or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.

(3) Use an alternative disposal method that has received prior approval by the Administrator.

[49 FR 13661, Apr. 5, 1984; 49 FR 25453, June 21, 1984]

§ 61.153 Standard for inactive waste disposal sites for asbestos mills and manufacturing and fabricating operations.

Each owner or operator of any inactive waste disposal site that was operated by sources covered under § 61.142, § 61.144, or § 61.149 and received deposits of asbestos-containing waste material generated by the sources, shall

(a) Comply with one of the following:

(1) Either discharge no visible emissions to the outside air from an inactive waste disposal site subject to this paragraph; or

(2) Cover the asbestos-containing waste material with at least 15 centimeters (6 inches) of compacted nonasbestos-containing material, and grow and maintain a cover of vegetation on

the area adequate to prevent exposure of the asbestos-containing waste material; or

(3) Cover the asbestos-containing waste material with at least 60 centimeters (2 feet) of compacted nonasbestos-containing material, and maintain it to prevent exposure of the asbestos-containing waste; or

(4) For inactive waste disposal sites for asbestos tailings, apply a resinous or petroleum-based dust suppression agent that effectively binds dust and controls wind erosion. Use the agent as recommended for the particular asbestos tailings by the manufacturer of the dust suppression agent. Obtain prior approval of the Administrator to use other equally effective dust suppression agents. For purposes of this paragraph, waste crankcase oil is not considered a dust suppression agent.

(b) Unless a natural barrier adequately deters access by the general public, install and maintain warning signs and fencing as follows, or comply with paragraph (a)(2) or (a)(3) of this section.

(1) Display warning signs at all entrances and at intervals of 100 m (330 feet) or less along the property line of the site or along the perimeter of the sections of the site where asbestos-containing waste material was deposited. The warning signs must:

(i) Be posted in such a manner and location that a person can easily read the legend; and

(ii) Conform to the requirements for 51 cm×36 cm (20"×14") upright format signs specified in 29 CFR 1910.145(d)(4) and this paragraph; and

(iii) Display the following legend in the lower panel with letter sizes and styles of a visibility at least equal to those specified in this paragraph.

Legend	Notation
Asbestos Waste Disposal Site	2.5 cm (1 inch) Sans Serif, Gothic or Block
Do Not Create Dust	1.9 cm (¾ inch) Sans Serif, Gothic or Block
Breathing Asbestos is Hazardous to Your Health.	14 Point Gothic.

Spacing between any two lines must be at least equal to the height of the upper of the two lines.

(2) Fence the perimeter of the site in a manner adequate to deter access by the general public.

(3) Upon request and supply of appropriate information, the Administrator will determine whether a fence or a natural barrier adequately deters access by the general public.

(c) The owner or operator may use an alternative control method that has received prior approval of the Administrator rather than comply with the requirements of paragraph (a) or (b) of this section.

§ 61.154 Air-cleaning.

(a) The owner or operator who elects to use air-cleaning, as permitted by §§ 61.142, 61.144, 61.147(c)(2), 61.147(d)(2), 61.148(b)(2), 61.149(b), 61.151(b), 61.151(c)(1)(ii), 61.152(b)(1)(ii), and 61.152(b)(2) shall:

(1) Use fabric filter collection devices, except as noted in paragraph (b) of this section, doing all of the following:

(i) Operating the fabric filter collection devices at a pressure drop of no more than .995 kilopascal (4 inches water gage), as measured across the filter fabric; and

(ii) Ensuring that the airflow permeability, as determined by ASTM Method D737-75, does not exceed 9 $m^3/min/m^2$ (30 $ft^3/min/ft^2$) for woven fabrics or 11 $m^3/min/m^2$ (35 $ft^3/min/ft^2$) for felted fabrics, except that 12 $m^3/min/m^2$ (40 $ft^3 min/ft^2$) for woven and 14 $m^3/min/m^2$ (45 $ft^3 min/ft^2$) for felted fabrics is allowed for filtering air from asbestos ore dryers; and

(iii) Ensuring that felted fabric weighs at least 475 grams per square meter (14 ounces per square yard) and is at least 1.6 millimeters (one-sixteenth inch) thick throughout; and

(iv) Avoiding the use of synthetic fabrics that contain fill yarn other than that which is spun.

(2) Properly install, use, operate, and maintain all air-cleaning equipment authorized by this section. Bypass devices may be used only during upset or emergency conditions and then only for so long as it takes to shut down the operation generating the particulate asbestos material.

(b) There are the following exceptions to paragraph (a)(1):

(1) If the use of fabric creates a fire or explosion hazard, the Administrator may authorize as a substitute the use of wet collectors designed to operate with a unit contacting energy of at least 9.95 kilopascals (40 inches water gage pressure).

(2) The Administrator may authorize the use of filtering equipment other than that described in paragraphs (a)(1) and (b)(1) of this section if the owner or operator demonstrates to the Administrator's satisfaction that it is equivalent to the described equipment in filtering particulate asbestos material.

[49 FR 13661, Apr. 5, 1984; 49 FR 25453, June 21, 1984]

§ 61.155 Reporting.

(a) Within 90 days after the effective date of this subpart, each owner or operator of any existing source to which this subpart applies shall provide the following information to the Administrator, except that any owner or operator who provided this information prior to April 5, 1984 in order to comply with § 61.24 (which this section replaces) is not required to resubmit it.

(1) A description of the emission control equipment used for each process; and

(2) If a fabric filter device is used to control emissions, the pressure drop across the fabric filter in inches water gage; and

(i) If the fabric device uses a woven fabric, the airflow permeability in $m^3/min/m^2$ and; if the fabric is synthetic, whether the fill yarn is spun or not spun; and

(ii) If the fabric filter device uses a felted fabric, the density in g/m^2, the minimum thickness in inches, and the airflow permeability in $m^3/min/m^2$.

(3) For sources subject to §§ 61.151 and 61.152:

(i) A brief description of each process that generates asbestos-containing waste material; and

(ii) The average weight of asbestos-containing waste material disposed of, measured in kg/day; and

(iii) The emission control methods used in all stages of water disposal; and

(iv) The type of disposal site or incineration site used for ultimate disposal, the name of the site operator, and the name and location of the disposal site.

(4) For sources subject to § 61.153:

(i) A brief description of the site; and

(ii) The method or methods used to comply with the standard, or alternative procedures to be used.

(b) The information required by paragraph (a) of this section must accompany the information required by § 61.10. The information described in this section must be reported using the format of Appendix A of this part.

(Approved by this Office of Management and Budget under control number 2000-0264)

(Sec. 114, Clean Air Act as amended (42 U.S.C. 7414))

§ 61.156 Active waste disposal sites.

To be an acceptable site for disposal of asbestos-containing waste material under §§ 61.151 and 61.152, an active waste disposal site must meet the requirements of this section.

(a) Either there must be no visible emissions to the outside air from any active waste disposal site where asbestos-containing waste material has been deposited, or the requirements of paragraph (c) or (d) of this section must be met.

(b) Unless a natural barrier adequately deters access by the general public, either warning signs and fencing must be installed and maintained as follows, or the requirements of paragraph (c)(1) of this section must be met.

(1) Warning signs must be displayed at all entrances and at intervals of 100 m (330 ft) or less along the property line of the site or along the perimeter of the sections of the site where asbestos-containing waste material is deposited. The warning signs must:

(i) Be posted in such a manner and location that a person can easily read the legend; and

(ii) Conform to the requirements of 51 cm × 36 cm (20" × 14") upright

format signs specified in 29 CFR 1910.145(d)(4) and this paragraph; and

(iii) Display the following legend in the lower panel with letter sizes and styles of a visibility at least equal to those specified in this paragraph.

Legend	Notation
Asbestos Waste Disposal Site.	2.5 cm (1 inch) Sans Serif, Gothic or Block.
Do Not Create Dust	1.9 cm (¾ inch) Sans Serif, Gothic or Block.
Breathing Asbestos is Hazardous to Your Health.	14 Point Gothic.

Spacing between any two lines must be at least equal to the height of the upper of the two lines.

(2) The perimeter of the disposal site must be fenced in a manner adequate to deter access by the general public.

(3) Upon request and supply of appropriate information, the Administrator will determine whether a fence or a natural barrier adequately deters access by the general public.

(c) Rather than meet the no visible emission requirement of paragraph (a) of this section, an active waste disposal site would be an acceptable site if at the end of each operating day, or at least once every 24-hour period while the site is in continuous operation, the asbestos-containing waste material which was deposited at the site during the operating day or previous 24-hour period is covered with either.

(1) At least 15 centimeters (6 inches) of compacted nonasbestos-containing material, or

(2) A resinous or petroleum-based dust suppression agent that effectively binds dust and controls wind erosion. This agent must be used as recommended for the particular dust by the manufacturer of the dust suppression agent. Other equally effective dust suppression agents may be used upon prior approval by the Administrator. For purposes of this paragraph, waste crankcase oil is not considered a dust suppression agent.

(d) Rather than meet the no visible emission requirement of paragraph (a) of this section, an active waste disposal site would be an acceptable site if an alternative control method for emissions that has received prior approval by the Administrator is used.

(Secs. 112 and 301(a) of the Clean Air Act as amended (42 U.S.C. 7412, 7601(a))

USEPA "Worker Protection Rule"

Toxic Substances; Asbestos Abatement Projects

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ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 763

[OPTS-62044A; FRL 2965-7]

Toxic Substances; Asbestos Abatement Projects

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: EPA is issuing a rule under section 6(a) of the Toxic Substances Control Act (TSCA). The rule will apply to asbestos abatement projects using employees not protected by regulations of the Occupational Safety and Health Administration (OSHA), by regulations of State plans adopted under the Occupational Safety and Health Act (OSHAct), or by State regulations in Idaho, Kansas, Oklahoma, and Wisconsin that EPA has determined are comparable to or more stringent than this rule.

DATE: This rule will be promulgated for purposes of judicial review at 1 p.m. eastern time on May 9, 1986. This rule is effective June 9, 1986.

FOR FURTHER INFORMATION CONTACT: Edward A. Klein, Director, Office of TSCA Assistance (TS-799), Office of Toxic Substances, Environmental Protection Agency, Rm. E-543, 401 M St., SW., Washington, D.C. 20460, Toll free: (800-424-9065). In Washington, D.C.: (554-1404). Outside the USA: (Operator-202-554-1404).

SUPPLEMENTARY INFORMATION:

I. Authority

Section 6(a) of TSCA authorizes EPA to impose a number of regulatory requirements concerning a chemical substance or mixture if EPA finds that there is a reasonable basis to conclude that the manufacture, processing, distribution in commerce, use, or disposal of the chemical substance, or any combination of such activities, presents or will present an unreasonable risk of injury to health or the environment. Among the requirements that EPA may impose are those listed in sections 6(a)(5) and 6(a)(6). Section 6(a)(5) of TSCA authorizes EPA to prohibit or otherwise regulate any manner or method of commercial use of a chemical substance or mixture. Section 6(a)(6) of TSCA authorizes EPA to prohibit or otherwise regulate any manner or method of disposal of a chemical substance or mixture or any article containing that substance or mixture, by any person who uses or disposes of it for commercial purposes.

These sections provide authority for EPA to issue this rule, which establishes requirements to protect State and local public employees conducting asbestos abatement activities. The asbestos in buildings where State and local public employees may be involved in abatement has been sold as a commercial product. Therefore, regulation of abatement activities affecting asbestos use in these buildings, such as encapsulation or enclosure, is considered regulation of commercial use. The removal of asbestos, a disposal activity, will affect a number of commercial activities that take place in the public buildings and, therefore, is considered disposal for commercial purposes.

II. Background

EPA proposed a rule under section 6(a) of TSCA to protect State and local public employees who take part in asbestos abatement projects, but who are not covered by the OSHA Asbestos Standard or by regulations of State plans adopted under the OSHAct, as published in the Federal Register of July 12, 1985 (50 FR 28530). The proposed rule was effective immediately under section 6(d) of TSCA and will remain in effect until this final rule becomes effective on June 9, 1986.

EPA received over 20 comments from the public on the proposed rule and the final rule that EPA is issuing today includes changes in response to the public comments. Those changes are discussed in Unit IV below.

This rule is part of an EPA program to address the risks associated with asbestos in schools. As part of that program, EPA has established regional information centers to provide information concerning the identification and abatement of asbestos hazards and to train people in proper abatement techniques. To ensure that asbestos abatement is performed safely and correctly, EPA is helping States establish certification programs for asbestos abatement contractors. EPA is giving grants to several States to help them set up contractor certification programs and is advising States on ways to implement such programs. Through its technical assistance program, EPA provides guidance on asbestos matters to school officials and local health and education departments. Finally, EPA has updated existing guidance material and prepared new material.

III. Provisions of the Rule

This rule applies to asbestos abatement projects using State and local government employees not covered by either (1) the OSHA Asbestos Standard, 29 CFR 1910.1001, (2) an Asbestos Standard adopted by a State as part of a State plan approved by OSHA under section 18 of the OSHAct, or (3) a State asbestos regulation in Idaho, Kansas, Oklahoma, or Wisconsin. EPA has determined that these four State regulations are comparable to or more stringent than this rule. The rule defines asbestos abatement project as "any activity involving the removal, enclosure, or encapsulation of friable asbestos material, except removal, enclosure, or encapsulation during sampling or routine repair of less than either 3 linear feet or 3 square feet of friable asbestos material." The rule defines friable asbestos material as "any material containing more than 1 percent asbestos by weight which, when dry, may be crumbled, pulverized, or reduced to powder by hand pressure." Thus, the sampling of friable asbestos material and the routing repair or less than either 3 linear feet or 3 square feet of friable asbestos material are not covered by this rule at all.

The rule with certain exceptions, requires employers to report to EPA at least 10 days before they begin an asbestos abatement project covered by this rule. The first exception is for asbestos abatement projects involving the removal, enclosure, or encapsulation of less than either 3 linear feet or 3 square feet of friable asbestos material. These projects do not have to be reported at all. The second exception is for emergency projects, which EPA defines as "a project involving the removal, enclosure, or encapsulation of friable asbestos material that was not planned but results from a sudden unexpected event." Examples of emergency projects are repairs necessitated by serious vandalism, flooding, fire, boiler failure, and ruptured water pipes. Emergency projects do not have to be reported to EPA 10 days in advance. Instead, they must be reported "as soon as possible, but in no case more than 48 hours after the project begins." The third exception is for employers who submit a notice to EPA under the National Emission Standard for Asbestos, 40 CFR 61.146, at least 10 days before they begin the asbestos abatement project and the notice clearly indicates that employees covered by this rule will perform some or all of the asbestos abatement work.

Reports under this rule must include the employer's name and address; the location, including street address, of the project; and the scheduled starting and completion dates for the project.

The regulatory requirements of the rule are very close to the current OSHA Asbestos Standard, with the same PEL and work practice requirements.

This rule, like the proposal, does not include the part of the current OSHA Asbestos Standard which states that personnel rotation is preferred over use of respirators to meet the permissible exposure requirements. OSHA has announced its intention to revoke that provision (Ref. 12). EPA agrees with OSHA's statement that personnel rotation merely increases the population at risk and would not reduce the absolute number of excess deaths attributable to asbestos according to mathematical models.

This rule, like the proposal and the current OSHA Asbestos Standard, requires that employers initially monitor each workplace to determine whether employees' exposure to asbestos is below the limits set in the rule. After the initial determination, employers must collect samples of air levels "of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of employees." EPA encourages persons to monitor asbestos levels daily during abatement projects.

Because of OSHA's extensive experience in administering and enforcing its Asbestos Standard, EPA generally intends to follow OSHA's administrative interpretations of identical provisions in the Asbestos Standard. This includes the OSHA interpretation that the medical surveillance requirements are triggered by an action level of 0.1 fiber per cubic centimeter (f/cc) as a 7- or 8-hour time weighted average. Employers must conduct personal and environmental monitoring as required by the rule to see if that level is exceeded.

EPA will also follow OSHA's administrative interpretation concerning respirator requirements during demolition or removal of asbestos. As stated by OSHA, employees about to engage in the removal of demolition of pipes, structures, or equipment covered or insulated with asbestos, or in the removal or demolition of asbestos insulation or coverings, must use a type "C" continuous flow or pressure-demand, supplied-air respirator regardless of the concentrations of asbestos to which they may be exposed. However, if the employer has conclusively established the upper concentration of airborne asbestos that employees could be exposed to during demolition or removal, and the concentration does not exceed 100 times either the 8-hour time-weight average or ceiling limits, then any of the respirators permitted by the rule that affords adequate protection at such upper concentrations of airborne asbestos may be used. The establishment of the upper concentrations of airborne asbestos fibers may require considerable effort if there are variations from operation to operation. Proof that the average airborne concentrations of asbestos fibers that an employee may be exposed to will not exceed 100 times the 8-hour, time-weighted average or ceiling, concentrations must be determined by the employer applying sound scientific or engineering principles.

EPA also wishes to clarify two provisons of the rule, which are identical to provisions of the current OSHA rule. First, the rule states that "insofar as practicable, asbestos shall be . . . removed . . . in a wet state sufficient to prevent the emission of airborne fibers in excess of the exposure limits . . ." EPA believes that it is practical to wet asbestos before removal in almost every situation.

Second, the rule states that "all external surfaces in any place of employment shall be maintained free of accumulations of asbestos fibers if, with their dispersion, there would be an excessive concentration." EPA believes that visible accumulations of asbestos-containing debris could lead to excessive concentrations and should not be left after the conclusion of an asbestos abatement project.

IV. Future Revisions to This Rule

As noted above, EPA is adopting most provisions of the current OSHA Asbestos Standard in this final rule. As pointed out by comments, OSHA has recognized that employees exposed to asbestos at levels permitted by its current standard face a significant risk to health (Ref. 12). As also noted in comments, OSHA has proposed amending the current Asbestos Standard to lower the PEL to either 0.2 f/cc or 0.5 f/cc and to adopt an Asbestos Standard for the Construction Sector. EPA will amend this rule to be consistent with OSHA proposal after OSHA isues a final standard. This will ensure that all public and private sector employees who participate in asbestos abatement projects enjoy similar levels of protection. When EPA amends this rule to be consistent with the final OSHA standard, EPA will give the States of Idaho, Kansas, Oklahoma, and Wisconsin an appropriate amount of time (at least 6 months) to make conforming changes to their regulations.

Because of the extensive comment already received on the OSHA Standard, EPA will issue this amendment without further solicitation of public comment. Therefore, EPA suggests that any additional comments on this approach be submitted to EPA at this time. Comments should be submitted to the address provided above.

In its proposed rule, OSHA included a provision requiring the employer to institute a training program for employees exposed to airborne concentrations of asbestos in excess of either 0.2 or 0.5 f/cc without regard to the use of respirators. EPA is considering a related provision requiring State and local governments covered by this rule to have any employees who participate in asbestos abatement trained in an asbestos abatement course. Such a provision could involve setting training course criteria. Persons who wish to comment on this possible provision should submit their comments at this time. Whether or not EPA adopts a training requirement through rulemaking, EPA would like to point out that the FY 1986 Asbestos School Hazard Abatement Act (ASHAA) appropriation requires schools who receive ASHAA funds to select contractors for their abatement projects who are either State-certified or have attended an EPA approved training course.

V. Response to Comments

EPA received and has analyzed over 20 comments from the public on the proposed rule. The following summarizes the major comments and discusses the changes in the final rule in response to those comments. A more extensive response to comments document appears in the rulemaking record.

There were comments that coverage of the rule was unclear. In response to these comments, EPA clarified the rule to indicate clearly that the rule applies to project performed to abate asbestos hazards and to other asbestos abatement projects performed as part of a renovation or repair project.

There were also comments concerning the persons intended to be protected by the rule. In response to those comments, EPA revised the rule to make clear that the rule applies to persons who take part in asbestos abatement projects and not to other persons who may incidentally come into contact with asbestos. Asbestos abatement workers face a greater likelihood of significant exposure to asbestos than other persons who only incidentally come into contact with asbestos.

The proposed rule applied to all asbestos abatement projects, with no exclusion for small projects. There were comments that the rule as applied to

small projects was unduly burdensome and would discourage necessary repair operations. In response to these comments, EPA decided to exclude routine repair of less than 3 linear or 3 square feet of friable asbestos material from the final rule. Thus minor, routine repairs of pipe insulation by sealing or taping would not be covered by the rule.

This change will allow persons to make these minor, routine repairs without using type "C" respirators or conducting air sampling. Applying these requirements would unnecessarily discourage needed repairs of damaged asbestos materials. As noted above, this exclusion applies only to repair of less than 3 linear or 3 square feet of friable asbestos material. EPA considered the alternative of excluding "small" repair projects without setting a numerical limit. However, EPA decided that this approach would create enforcement difficulties since "small" is a very subjective term.

One comment noted that the proposed rule could be interpreted as covering the removal of friable asbestos material during sampling. This could discourage persons from sampling to identify potential asbestos hazards, thus delaying the abatement of some hazards. In response to this comment, EPA decided to clarify the rule to exclude any removal, enclosure, or encapsulation during sampling from coverage.

In the proposal, EPA requested comment on whether this rule should apply in States that do not have an OSHA-approved State plan but have comparable or more stringent regulations protection public employees who perform asbestos abatement work. EPA encouraged States with such regulations to inform EPA about the regulations during the comment period. Idaho, Kansas, Oklahoma, and Wisconsin brought their regulations to EPA's attention. EPA has decided that these regulations are comparable or more stringent that this rule and decided to exclude those States from coverage under this rule. A document which summarizes how EPA determined that these State regulations are comparable or more stringent appears in the record for this rule.

If any other State has a comparable or more stringent regulation now or adopts one in the future and wishes to be excluded from this rule, that State should send a copy of the regulation to EPA's Office of Toxic Substances (TS-792), 401 M Street St., SW., Washington, D.C. 20460 and request to be excluded from the rule. EPA will review the regulation and tentatively determine whether the regulation is comparable or more stringent that this rule. If EPA makes this tentative determination, EPA will propose an amendment to this rule, excluding that State from coverage. Interested persons could comment on the proposed exclusion during a period for public comment. After considering any comments, EPA could promulgate the final rule amendment.

In the proposal, EPA requested comment on the appropriate definition of asbestos. The definition in the proposal differs from OSHA's in that the EPA definition excludes non-asbestiform tremolite. EPA received one comment that it should adopt the OSHA definition and other comments that the EPA definition should be modified somewhat to make it more mineralogically correct. EPA has decided to retain the proposed definition in the final rule. This definition has been used by EPA in the past and is understood by the regulated community.

EPA also received comment on the definition of asbestos fibers. In the proposal, EPA defined the term as "asbestos fibers longer than 5 micrometers. EPA is adopting the same definition in this rule to be consistent with OSHA. OSHA adopted the definition because of practical difficulties in measuring concentrations of smaller fibers. EPA believes that smaller fibers present a health risk but agrees with OSHA that it is difficult to monitor for smaller fibers.

EPA received four comments questioning the proposed requirement of annual chest roentgenograms (X-rays) for persons exposed to asbestos at a level greater than 0.1 f/cc for a 7- or 8-hour TWA. Some comments stated that the diagnostic value of annual chest roentgenograms are outweighted by the risk associated with X-ray exposure. In response to these comments, EPA has modified the rule to make clear that chest roentgenograms are required only at the discretion of the physician.

EPA received comments concerning the reference in the proposed rule to respirators approved by the Bureau of Mines (BOM). The comment pointed out that while there may be respirators still in use which were originally approved by BOM, the Mine Safety and Health Administration (MSHA) has replaced BOM in this task. The final rule has been changed to make clear that respirators approved by the National Institute for Occupational Safety and Health, BOM, or MSHA may be worn.

EPA received one comment concerning a typographical error in the rule. The proposal incorrectly stated that "the employee shall provide two separate lockers. . . ." The final rule corrects this error and provides that "the employer shall provide two separate lockers. . . ."

EPA received comments that a PEL of 2.0 f/cc does not provide sufficient protection. As explained above, EPA is adopting the PEL in this rule to be consistent with OSHA, but expects to amend this rule to adopt a lower PEL in accordance with OSHA in the future. To ensure greater protection of abatement workers and building occupants during asbestos abatement than that now required by this rule, EPA strongly encourages all persons to follow EPA guidance materials and take additional steps to control exposure to asbestos. EPA encourages persons to contact a Regional Asbestos Coordinator or the TSCA Assistance Office to obtain EPA guidance documents and other technical assistance information. EPA also notes that many asbestos abatement projects subject to this rule are subject to the requirements of the National Emission Standard for Asbestos, 40 CFR 61.146, issued by EPA under the Clean Air Act.

VI. Regulatory Assessment

Under section 6(c)(1) of TSCA, EPA must consider the following factors when determining whether a chemical substance or mixture presents an unreasonable risk:

1. The effects of such substance or mixture on health and the magnitude of the exposure of human beings to such a substance or mixture.

2. The effects of such substance or mixture on the environment and the magnitude of the exposure of the environment to such substance or mixture.

3. The benefits of such substance or mixture for various uses and the availability of substitutes for such uses.

4. The reasonably ascertainable economic consequences of the rule, after consideration of the effect on the national economy, small business, technological innovation, the environment, and public health.

After considering the above factors, EPA makes the following findings concerning the unregulated removal, enclosure, or encapsulation of friable asbestos material.

A. Health Effects and Magnitude of Exposure to Asbestos

1. *Health effects.* The following summarizes the health effects of asbestos. They are similar to those in the preamble to the proposed rule. EPA received no comments disagreeing with EPA's assessment of the health effects of asbestos. Detailed discussion and assessment of the health effects of asbestos may be found in the "Report to

the United States Consumer Product Safety Commission (CPSC), by the Chronic Hazard Advisory Panel on Asbestos" (CHAP) (Ref. 1), "Health Effects and Magnitude of Exposure" in EPA's "Support Document for Final Rule of Friable Asbestos-Containing Materials in School Buildings." (Ref. 4) and the "Report of the (National Research Council) Committee on Nonoccupational Health Risks of Asbestiform Fibers" (Ref. 6).

EPA finds that the adverse human health effects from exposure to asbestos are extremely serious. Asbestos is a known human carcinogen that also causes other lung diseases.

Asbestos has been thoroughly examined in numerous epidemiology studies. The life-threatening diseases that have been repeatedly identified are asbestosis, lung cancer, and mesothelioma. Also associated with asbestos exposure in some studies are cancers of the larynx, pharynx, gastrointestinal tract, kidney, and ovary and respiratory diseases such as pneumonia. Major health effects are discussed below.

Asbestosis, which involves fibrosis of lung and pleural tissue, is a serious chronic disease associated with exposure to asbestos. There is no effective treatment for asbestosis and it is often disabling or fatal. Asbestosis is diagnosed from findings which may include radiographic changes, breathlessness, and abnormal lung function. Since some clinical symptoms of asbestosis are similar to those of other fibrosing lung diseases, a history of occupational exposure to asbestos is often a key feature of its diagnosis. Asbestosis can appear and progress decades after exposure to asbestos fibers. This is partly true because some inhaled asbestos fibers remain in the body for the lifetime of a victim. Under working conditions where average fiber concentrations in the air were high (more than 10 fibers per cubic centimeter) asbestosis has accounted for more than 17 percent of observed deaths (Ref. 11). It is apparently less common than lung cancer or mesothelioma at exposures lower than the current OSHA workplace standard of 2.0 f/cc. Some recent data on the incidence of asbestosis appear compatible with a linear exposure-response relationship with no threshold (Ref. 12).

Lung cancer is currently responsible for the largest number of deaths from exposure to asbestos. It has been associated with exposure to all the principal commercial asbestos fiber types. Excess lung cancer has been documented in groups involved with the mining and milling of asbestos and the manufacture and use of asbestos products. Studies in which the extent of exposure can be approximated provide evidence that lung cancer increases linearly with both level and duration of exposure. Cigarette smoking and asbestos have a strong synergistic interaction in development of lung cancer. Asbestos exposure appears to multiply the underlying risk of lung cancer. Consequently, when exposed to asbestos, the risk of lung cancer for smokers (for whom the risk of lung cancer is already high) is much higher than that for nonsmokers exposed to asbestos.

Many human studies have also shown that exposures to asbestos produce mesotheliomas, which are cancers that occur as thick diffuse masses in the serous membranes (mesothelia) that line body cavities. Mesotheliomas occur in the pleura (the membrane that surrounds the lungs and lines the lung cavity) and the peritoneum (which surrounds the abdominal organs and lines the abdominal cavity). Both forms of mesothelioma are nearly always fatal within the first 2 years after diagnosis. Epidemiology studies suggest that the incidence of mesothelioma is related to dose and time from first exposure. Association of mesothelioma with smoking is weak or nonexistent. Asbestos fibers appear, by far, to be the most common cause of mesotheliomas.

In occupational studies where the primary route of exposure is through inhalation, lung cancer and mesotheliomas usually account for about 90 percent of the excess cancers seen among workers. However, as noted in the CHAP report (Ref. 1), a number of other cancers, principally of the gastrointestinal tract, have been associated with asbestos exposure. These are cancers of the larynx, pharynx, oral cavity, esophagus, stomach, colon, and rectum. Statistically significant excesses of cancers of the kidney and ovary have also been shown in some studies. In addition, the excess of cancers at all other sites combined is statistically significant in some studies.

The conclusions from epidemiology studies concerning the health effects of asbestos are also supported by results of laboratory studies. Animals treated with asbestos have shown increased incidence of fibrosis, lung cancer, and mesotheliomas. All commercial forms and several other types of asbestos are implicated from a variety of modes of exposure. Animal studies, however, have not shown an increased incidence of gastrointestinal or other cancers.

Most occupational studies have been conducted on populations exposed to high airborne concentrations of asbestos for long periods of time. However, short-term occupational exposures, have also been shown to increase the risk of lung cancer and mesothelioma (Ref. 9). In addition, there are many documented cases of mesothelioma linked to extremely brief exposure to high concentrations of asbestos or long-term exposure to low concentrations (Ref. 4).

Direct evidence of adverse health effects from nonoccupational asbestos exposure also exists. Persons who lived in the household of asbestos workers have developed pleural mesothelioma and signs of asbestosis (Ref. 10). A number of mesotheliomas have also been documented among populations whose only identified exposure was from living near asbestos mining areas, asbestos product factories, or shipyards where asbestos use had been very heavy (Ref. 4).

In addition to exposure to asbestos fibers in the air, the general population is also exposed through various oral sources, including drinking water containing asbestos. Because of the potential for oral exposure as well as the excess of gastrointestinal tract cancers that has frequently been found in occupational groups exposed to asbestos in the air, there has been much study of the possible health effects of ingestion of asbestos fibers. Despite those efforts, evidence showing health effects from ingestion is still ambiguous (Ref. 5).

2. *Cancer risk extrapolation.* As discussed above, numerous human studies have demonstrated that exposure to asbestos has increased the risk of cancer and asbestosis. This unit presents EPA's approach in estimating the cancer risk attributable to exposures during the removal, enclosure, or encapsulation of friable asbestos.

Since a number of epidemiology studies indicate a positive relationship between asbestos exposure and the risk of lung cancer, several models may be used to extrapolate from risk at high exposure to risk at lower exposure. The model that EPA believes is most consistent with available human and animal data is the linear nonthreshold dose/response model. This model assumes that: (1) Any exposure increases risk, and (2) the increase in risk is proportional to the background risk in the nonexposed population and to the level of exposure, defined as duration of exposure times concentration of asbestos fibers to which populations may be exposed.

The choice of the linear model appears reasonable since there is no evidence for a threshold level of asbestos exposure below which there is

no increased risk. It is further supported by evidence of cancers among populations whose asbestos exposure is believed to have been lower than levels reported in the epidemiology studies of asbestos workers mentioned above.

The model adopted by EPA to estimate excess mesothelioma incidence due to asbestos exposure relates disease incidence to dose and the time from first exposure (minus 10 years) raised to the third power. This model reflects a delay (or minimum latency period) of 10 years between first exposure and the likely earliest possible appearance of the disease. Both the lung cancer and mesothelioma models have also been adopted by OSHA (Ref. 12). The National Research Council Committee on Nonoccupational Health Risks of Asbestiform Fibers also adopted a similar linear nonthreshold model to estimate risk to nonoccupational populations from exposure to asbestos (Ref. 6). The derivation and validation of the models is discussed in detail in the CHAP report (Ref. 1) and in EPA's "Regulatory Impact Analysis of Controls on Asbestos and Asbestos Products" (Ref. 3).

Although EPA believes that excess mortality from asbestosis and cancers other than lung cancer and mesothelioma could occur from exposure to asbestos released during asbestos abatement operations, EPA has not attempted to quantify that excess mortality since lung cancer and mesothelioma appear to present the greatest threats to human health at current exposure levels. Thus, the model could understate the risk to humans from asbestos exposure.

The risk of asbestos-induced disease may be modified by several factors. As mentioned in the earlier discussion on lung cancer, smoking drastically increases the risk of developing lung cancer from exposure to asbestos. Because of their lower underlying risk, the absolute increase of incidence of lung cancer in nonsmokers is about one-tenth of that in smokers. However, complete control of the smoking factor (if possible) would leave a substantial health risk since the risk of mesothelioma (which is apparently unaffected by smoking) and the risk of lung cancer to nonsmokers would still remain.

Another factor that may affect the risk of asbestos-induced disease is the possible differences in biological potency among the different fiber types. The National Research Council (Ref. 6) studied this issue and concluded:

> Results of studies of various groups of workers indicate that it is extremely difficult to assess the role of fiber type (e.g., chrysotile or crocidolite) in determining the risk for developing either lung cancer or mesothelioma. Analysis of the epidemiological studies is complicated because of variations in type of industry, the diverse fiber characteristics within an industry, and the usual inadequacy of exposure data. Some scientists have interpreted the available epidemiological data to indicate that chrysotile asbestos, the asbestos type most commonly used in the United States, is less hazardous than the other types of asbestos, especially crocidolite. Such arguments have been used in the United Kingdom and other countries to rationalize different regulatory controls for crocidolite and chrysotile. However, in view of the laboratory evidence and great uncertainty about the nature of the fibers of asbestos to be found in nonoccupational exposure situations, the committee decided not to differentiate among them in the quantitative risk assessment. Furthermore, some of the apparent discrepancies may be explained by differences in physical properties of the fibers, their concentrations, and their characteristics in the different environments. These possibilities need further testing.

In view of this uncertainty about the relative potency of the various asbestos types and in view of the well-documented health hazard of the most common commercial form of asbestos, EPA has concluded that it is prudent to treat all asbestos fiber types as having equivalent biological activity.

Fiber morphology has also been suggested as a factor that may affect incidence of asbestos-induced disease. Animal studies in which asbestos fibers were applied by injection or implantation suggest that longer and finer fibers are more carcinogenic than shorter and coarser fibers. This has not, however, been confirmed by inhalation studies. EPA has not differentiated among fiber sizes in its assessment of the potential risk of asbestos. First, asbestos fibers released during asbestos abatement projects consist of a great range of dimensions, including those suggested as most dangerous. Second, it has not been clearly shown that short fibers pose a significantly smaller risk. No dimensional threshold for potency has been established.

3. *Magnitude of human exposure.* Persons can be exposed to high levels of airborne asbestos in or near the work area during asbestos abatement projects. Peak exposure during the removal of asbestos insulation have been measured at levels ranging from 4.5 f/cc to 82.2 f/cc. Mean exposure levels during the dry removal of an asbestos-containing ceiling have been measured at 42.2 f/cc. Mean exposure levels during the wet removal of an asbestos-containing ceiling have been measured at 23.1 f/cc. Mean exposure levels during removal of an asbestos-containing ceiling using water and a surfactant have been measured at 8.1 f/cc (Refs. 2 and 13). OSHA has estimated that average airborne concentrations in the dry wall removal, renovation, and demolition industry are 20 f/cc (Ref. 12).

There may also be much exposure to asbestos during the encapsulation and enclosure of friable asbestos material. Using an electron microscope, levels of 40, 380, 390, and 8,740 nanograms per cubic meter were found in samples taken in the work area with a mobile pump during painting with an encapsulant. Samples taken by personal pumps worn by two painters during encapsulation showed very low levels in one case and levels of 1,000, 1,700, 2,300, and 13,000 nanograms per cubic meter in the other case (Ref. 14). EPA has received anecdotal evidence that there may be much exposure to asbestos during enclosure of friable asbestos material.

Based on available exposure information, EPA estimated in the proposal that unregulated dry removal of asbestos results in exposure levels of 24.0 f/cc in the work area during abatement, 1.6 f/cc outside the work area during abatement and 0.8 f/cc outside the work area post abatement. EPA estimated that unregulated wet removal of asbestos results in exposure levels of 18.0 f/cc in the work area during abatement, 0.9 f/cc outside the work area during abatement, and 0.5 f/cc in the building post abatement (Ref. 13). Many of the estimates were based on data reported in studies, while others were essentially assumed due to a lack of data (Ref. 13). EPA received no comments on these estimates.

EPA estimated in the proposal that this rule would reduce the concentrations of airborne asbestos to 11.9 f/cc in the work area during abatement, 0.3 f/cc outside the work area during abatement, and 0.5 f/cc in the building post abatement (Ref. 13). These figures are estimated averages for all abatement projects. Individual projects are likely to have different concentrations. EPA received no comments on these estimates.

EPA estimated in the proposal that about 450 abatement workers per year would be covered by this rule. This was based on an estimate of the number of abatement projects each year and an estimate of the percentage of those projects in which State and local employees are used. The number of employees covered by the rule during repair and maintenance work involving the removal, enclosure or encapsulation

of friable asbestos material was not estimated. One comment asserted that as many as 75,000 State and local workers could be covered during these activities. EPA believes that this estimate is high.

In the proposal, EPA estimated that asbestos abatement workers would be exposed to asbestos during abatement for 3 to 6 days a year. In addition, other persons would be exposed to asbestos as a result of asbestos abatement activities. EPA estimated that about 1,250 other State and local public employees, such as public school teachers, other public school personnel, public hospital staff, and State and local government office workers, would be exposed during abatement and about 3,700 employees would be exposed post abatement. EPA also estimated that about 400 other building occupants such as school children and hospital patients and visitors would be exposed during abatement and about 38,600 other occupants and visitors would be exposed post abatement (Ref. 13). EPA received comments that it underestimated the number of asbestos abatement projects covered by this rule. If these comments are accurate, then this rule will potentially protect even more persons.

B. Environmental Effects

Section 6(c) of TSCA requires that EPA state the relevant environmental factors and key considerations which form the basis for regulatory action under section 6(a). The unreasonable risk finding of this rule is based solely on risks to human health since these risks are by far the most serious consequence of unregulated removal, enclosure, or encapsulation of friable asbestos material and are sufficient to support this rule. EPA received no comments on this point.

C. Benefits of Asbestos Products and Availability of Substitutes

EPA finds that the benefits of the asbestos-containing products affected by this rule are minimal. This rule applies only when persons have already decided to remove, enclose, or encapsulate friable asbestos material. These people presumably will have already determined that there are no benefits in using the asbestos-containing material in its present condition. In addition, there are adequate substitutes for the asbestos products that are being removed from buildings. EPA received no comments on this point.

D. Economic Effects of the Rule

This portion of the preamble presents EPA's determination of the "reasonably ascertainable economic consequences of the rule, after consideration of the effect on the national economy, small business, technological innovation, the environment, and public health" as required by section 6(c)(1)(D) of TSCA.

EPA estimates that this rule will increase the cost of asbestos abatement to some extent. In the proposal, EPA estimated that the rule would increase the cost of typical abatements as follows:

Project	Without rule	With rule	Increase	Percent increase
School	$12,900	$15,300	$2,400	18
Office building	18,800	22,000	3,200	17
Hospital	58,500	65,800	7,300	12
Boiler room	3,700	4,900	1,200	32
Boiler pipes	1,700	2,600	900	54

In the proposal, EPA estimated that the rule would increase the costs of asbestos abatement a total of about $730,000. This figure represents the present value of costs incurred over the next 15 years, assuming that all friable asbestos is abated. EPA also estimated that this rule would avoid about 200 cancer cases. This is about $3,650 per cancer case avoided.

EPA received comments indicating that the total costs of the rule were understated because EPA underestimated the number of asbestos abatement projects covered by this rule. EPA acknowledges that the estimate of asbestos abatement projects may have been low because it did not take into account many maintenance and repair operations. However, EPA has excluded some of these small projects from coverage in the final rule. In addition, even if the number of asbestos abatement projects is higher than estimated by EPA, both the costs of the rule and the number of cancer cases avoided would have been underestimated in roughly the same proportion in the proposal. Thus, this possible underestimate would not change the cost per cancer case avoided by the rule.

This rule will not have a direct impact on small business since it applies only to those public employees not covered by the OSHA Asbestos Standard. However, by establishing regulatory requirements for public employees similar to those of private employees under OSHA jurisdiction, the rule will eliminate cost advantages that may encourage the use of public employees rather than private contractors for asbestos abatement. This rule may, therefore, bring about increased use of private contractors, some of which are small businesses. This rule could have an impact on small government entities because it would increase the cost of performing asbestos abatement activities using public employees. However, the rule will not increase the cost of using contractors to perform asbestos abatement and would not require any government entity to undertake asbestos abatement activities.

EPA does not believe that this rule will restrict technological innovation. The rule allows sufficient flexibility for the development of new technology concerning asbestos abatement.

E. Other EPA Statutes

Section 6(c) of TSCA requires that if EPA determines that a risk of injury to health or the environment could be eliminated or reduced to a sufficient extent by actions taken under another statute administered by EPA, EPA may not promulgate a rule under section 6(a) of TSCA unless EPA finds it is in the public interest to protect against the risk by action under TSCA. EPA finds that no other law administered by EPA will eliminate or reduce the risks to the workers associated with the removal, renovation, or encapsulation of asbestos to a sufficient extent.

Several EPA statutes have been used to limit asbestos exposure. In 1973, EPA used the authority of the Clean Air Act (CAA) to list asbestos as a hazardous air pollutant, establish a "no visible" emission standard for manufacturers, and ban the use of spray-applied asbestos-containing material as insulation in buildings. The regulation was published in the Federal Register of April 6, 1973 (38 FR 8826). EPA amended this regulation in 1975 to ban asbestos-containing pipe lagging, by a rule published in the Federal Register of October 12, 1975 (40 FR 48292); and in 1978 extended the ban to all uses of sprayed-on asbestos by a rule published in the Federal Register of June 19, 1978 (43 FR 26372). The CAA rule also regulates operations involving the demolition or renovation of buildings containing friable asbestos and the disposal of wastes generated by such operations.

However, the CAA has limitations. The CAA does not apply directly to the protection of workers exposed to indoor air. Consequently, any possible additional use of that statute could leave many workers exposed to indoor situations of inadequate protection.

An additional EPA statute that could be used to limit asbestos exposure is the Resource Conservation and Recovery Act (RCRA). Under RCRA, EPA could list asbestos as a hazardous waste and

subject asbestos waste to general RCRA requirements designed to reduce exposure. However, such action under RCRA would reduce exposure only when the wastes from asbestos removal are ultimately placed in disposal facilities. It would not reduce exposure during the actual removal, enclosure, or encapsulation of asbestos products. Therefore, EPA finds that the risk from asbestos abatement projects cannot be eliminated or reduced to a sufficient extent by actions taken under another statute administered by EPA.

F. Other Options Considered

Section 6 of TSCA requires that EPA apply the least burdensome requirements to reduce an unreasonable risk. EPA considered the following options for reducing the risks associated with the removal, enclosure, or encapsulation of asbestos without any regulatory controls beyond those required by the National Emission Standard for Asbestos.

1. *Take no regulatory action under TSCA; instead provide the public with information and technical assistance.* Under this option, EPA would take no regulatory action, beyond that already taken as part of the National Emission Standard for Asbestos; but would instead provide the public with information and technical assistance. EPA is already increasing the information and technical assistance it provides the public. Persons could use that information to reduce the risk to public employees who perform asbestos abatement work during the removal, enclosure, or encapsulation of asbestos.

This approach would minimize the burden caused by regulatory action. However, this option is an inadequate response given the high risk to abatement workers associated with the removal, enclosure, or encapsulation of asbestos following only the requirements of the National Emission Standard for Asbestos. The National Emission Standard for Asbestos was designed to limit the release of asbestos to the ambient air and only incidentally protects abatement workers inside a building.

2. *Take no regulatory action under TSCA; instead defer to the States.* Under this option, EPA would take no regulatory action beyond that already taken as part of the National Emission Standard for Asbestos but would instead provide the States with information and technical assistance so that States can adopt regulations to protect public employees who perform asbestos abatement work.

This approach would minimize the burden caused by Federal regulatory action. However, this option is an inadequate response since a number of States have not taken action in this area in the past and may not take action in the future. Still, EPA encourages States to take action to protect such public employees with requirements more stringent than those in this rule. As stated earlier, employees exposed to asbestos at the level permitted by this rule still face a risk to health.

3. *Propose a rule which provides greater protection than the current OSHA Asbestos Standard.* OSHA has recognized that its current Asbestos Standard is inadequate and has begun rulemaking to adopt a new standard. EPA could issue a rule closer to the proposed OSHA standard or closer to the recommendations for worker protection in EPA's technical guidance documents. As stated earlier, EPA decided to follow the current OSHA Asbestos Standard closely to maintain consistency among Federal agencies. However, EPA expects to adopt a rule very similar to the final OSHA Asbestos Standard after OSHA issues that rule. This will ensure that all public and private sector employees who take part in asbestos abatement work enjoy similar levels of protection.

G. Analysis Under Section 9(a) of TSCA

Section 9(a) of TSCA requires EPA to review other Federal authorities not administered by EPA to determine whether action under those authorities may prevent or reduce to a sufficient extent such risks. EPA has reviewed other Federal authorities. The only statute not administered by EPA that could reduce such risks is the OSH Act. However, this rule covers only persons not covered by the OSHA Asbestos Standard. OSHA currently has no statutory authority to cover public employees in a State without an OSHA-approved State plan and 27 States do not have an approved plan. Thus, EPA cannot determine that there is a statute administered by another Federal agency that can prevent or reduce the risk presented to persons not covered by the OSHA Asbestos Standard during the removal, enclosure, or encapsulation of friable asbestos.

VII. Finding of Unreasonable Risk

EPA has weighed the health risks from unregulated asbestos abatement against the costs attributable to the proposed regulation. EPA estimates that this rule would avoid about 200 cancer cases, among abatement workers, other employees in buildings where abatement occurs, and visitors to such buildings while costing about $730,000 over 15 years. This is about $3,650 per cancer case avoided. Even if EPA underestimated the number of asbestos abatement projects covered by this rule, the cost per cancer case avoided would be about the same. EPA has concluded that the avoidance of these premature deaths substantially outweighs the costs of the control measures required.

Therefore, EPA finds that unregulated removal, enclosure, or encapsulation of friable asbestos material presents an unreasonable risk to human health and proposes to require that certain measures be taken to reduce the risk faced by asbestos abatement workers and persons using and visiting buildings during and after asbestos abatement activities. The finding is based on the following points:

1. The health effects from asbestos exposure are very serious. Asbestos is a demonstrated human carcinogen. The cancers caused by asbestos are usually fatal and cause much pain and suffering.

2. Available evidence supports the conclusion that there is no safe level of exposure to asbestos. This conclusion is consistent with present theory of cancer etiology and is further supported by the many documented cases where low or short-term exposure has been shown to cause asbestos-related disease.

3. Models developed to estimate the relative risk of developing cancer from exposure to asbestos show a linear dose-response relationship. Based on data from epidemiology studies, these models predict that humans exposed to even very low levels of asbestos incur some risk.

4. Many persons are involved in asbestos abatement activities, but are not protected by the OSHA Asbestos Standard.

5. Persons can be exposed to high levels of airborne asbestos if they conduct asbestos abatement without any exposure controls.

6. If persons attempt to abate asbestos hazards, but do so incorrectly, there may be very high levels of exposure to asbestos on the part of abatement workers, other employees who work in the building, and visitors to the building. These levels may far exceed the levels of exposure permitted by the current OSHA Asbestos Standard. For example, in schools that incorrectly abate asbestos hazards, school teachers and other school employees and school children could be exposed as well as abatement workers. State and local public employees could potentially take part in asbestos abatement activities in all State and local public buildings in the States not covered by OSHA State plans.

7. The estimated incremental economic costs of this rule are minimal in view of the number of cancers that may be avoided by the rule.

VIII. Enforcement

Section 15 of TSCA makes it unlawful to fail or refuse to comply with any provision of a rule promulgated section 6 of TSCA. Therefore, failure to comply with this rule would be a violation of section 15 of TSCA. In addition, section 15 of TSCA makes it unlawful for any person to: (1) Fail or refuse to establish and maintain records as required by this rule; (2) fail or refuse to permit access to or copying or records, as required by TSCA; or (3) fail or refuse to permit entry or inspection as required by section 11 of TSCA.

Violators may be subject to both civil and criminal liability. Under the penalty provision of section 16 of TSCA, any person who violates section 15 could be subject to a civil penalty of up to $25,000 for each violation. Each day of operation in violation of this rule could constitute a separate violation. Knowing or willful violations of this rule could lead to the imposition or criminal penalties of up to $25,000 for each day of violation and imprisonment for up to 1 year. In additional, other remedies are available to EPA under sections 7 and 17 of TSCA, such as seeking an injunction to restrain violations of this rule.

IX. Confidentiality

A person may assert a claim of confidentiality for any information, including public comments, submitted to EPA in connection with this rule. Any person who submits a confidential public comments must also submit a nonconfidential version. Any claim of confidentiality must accompany the information when it is submitted to EPA. Persons would claim information confidential by circling, bracketing, or underlining it and marking it with "CONFIDENTIAL" or some other appropriate designation. EPA will disclose information subject to a claim of confidentiality only to the extent permitted by section 14 of TSCA and 40 CFR Part 2, Subpart B. If a person does not assert a claim of confidentiality for information at the time it is submitted to EPA, EPA may make the information public without further notice to that person.

X. Rulemaking Record

EPA has established a record for this rulemaking (docket control number OPTS-62044). A public version of the record, without any confidential business information, is available to the public in the Office of Toxic Substances Public Information Office, from 8 a.m. to 4 p.m., Monday through Friday, except legal holidays. The Public Information Office is located in Rm. E-107, 401 M St., SW., Washington, D.C.

The record includes information considered by EPA in developing this rule. The record now includes the following categories of information:

1. Federal Register notices.
2. Support documents.
3. Reports.
4. Memoranda and letters.

The record also includes by reference the rulemaking record compiled by OSHA as part of the revision of the OSHA Asbestos Standard. Persons may point out any errors or omissions in the record by May 9, 1986.

XI. References

(1) USCPSC. Reports to the U.S. Consumer Product Safety Commission by the Chronic Hazard Advisory Panel on Asbestos. July 1983.

(2) USEPA. OPTS. OTS. Exposure Assessment for Asbestos. Draft January 9, 1984.

(3) USEPA. OPTS. OTS. Regulatory Impact Analysis of Controls on Asbestos and Asbestos Products. Draft March 1985.

(4) USEPA. OPTS. OTS. Support Document for Final Rule on Friable Asbestos-Containing Materials in School Buildings-Health Effects and Magnitude of Exposure. January, 1982.

(5) National Research Council. "Asbestos" In: *Drinking Water and Health*. Vol. 3. National Academy Press. Washington, D.C. (1982): 223-263.

(6) National Research Council. "Nonoccupational Health Risks of Asbestiform Fibers." National Academy Press. Washington, D.C. 1984.

(7) NIOSH-OSHA Asbestos Work Group. Workplace Exposure to Asbestos: "Review and Recommendations." DHHS (NIOSH) Publication No. 81-103. U.S. Government Printing Office, Washington, D.C. 20402. (1980).

(8) OSHA. "Quantitative Risk Analysis for Asbestos-Related Cancers: A Preliminary Report." (1983).

(9) Seidman, H., Selikoff, I.J., Hammond, E.C., "Short-Term Observation." In: "Annals of the New York Academy of Science," 330 (1979): 61-89.

(10) Selikoff, I.J., Anderson, H.A., Seidman, H. "Asbestos Disease Among Household Contacts of Asbestos Workers." In: "Disability Compensation for Asbestos-Associated Disease in the U.S.," edited by I.J. Selikoff. Environmental Sciences Laboratory, Mount Sinai School of Medicine of the City University of New York. (1982): 73-78.

(11) Selikoff, I.J., Hammond, E.C., Seidman, H., "Mortality Experience of Insulation Workers in the U.S. and Canada, 1943-1976." In: "Annals of the New York Academy of Science." 330 (1979): 91-116.

(12) USDOL. OSHA. "Occupational Exposure to Asbestos: Proposed Rule and Notice of Hearing. (April 10, 1984: 49 FR 14116)."

(13) USEPA. OPTS. OTS. Asbestos Abatement Rules: A Preliminary Cost-Effectiveness Analysis. Revised Draft Report May, 1985.

(14) USEPA. OPTS. OTS Evaluation of Asbestos Techniques: Encapsulation. Draft Report April 1985.

XII. Regulatory Assessment Requirements

A. Executive Order 12291

Under Executive Order 12291, EPA prepared a Cost-Effectiveness Analysis. The Analysis estimated that this rule would cost about $730,000 over 15 years, while avoiding about 200 fatal cancer cases. This is a cost of about $3,650 per cancer case avoided. As shown in Unit V above, EPA believes that these costs are reasonable. Under Executive Order 12291, EPA must judge whether a regulation is "Major" and therefore requires a Regulatory Impact Analysis. EPA has determined that this rule is not a "Major Rule" because it will not have an effect on the economy of $100 million or more and it will not have a significant effect on competition, costs, or prices.

This rule was submitted to the Office of Management and Budget (OMB) for review as required by Executive Order 12291.

B. Regulatory Flexibility Act

EPA has analyzed the economic impact of this proposed rule on small businesses. A summary of EPA's analysis appears in Unit VI.D.

C. Paperwork Reduction Act

The information collection requirements in this rule were submitted to the Office of Management and Budget (OMB) for approval under the Paperwork and Reduction Act of 1980, 44 U.S.C. 3501 et seq. (Control No. 2070-0072). EPA received comments that 10-day advance notice of asbestos abatement projects is burdensome in particular instances such as emergency repairs. EPA has responded to those comments by not requiring 10-day advance notice of emergency projects. Instead, those projects must be reported to EPA as soon as possible. In addition, EPA has excluded small asbestos abatement projects from the reporting requirements of this rule.

List of Subjects in 40 CFR Part 763

Environmental protection, Hazardous substances, Recordkeeping and reporting requirements, Asbestos.

Dated: April 17, 1986.

Lee M. Thomas,

Administrator.

PART 763—[AMENDED]

Therefore, 40 CFR Part 763 is amended as follows:

1. The authority citation for Part 763 continues to read as follows:

Authority: 15 U.S.C. 2605 and 2607(c).

2. Subpart G is revised to read as follows:

Subpart G—Asbestos Abatement Projects

Subpart G—Asbestos Abatement Projects

§ 763.120 Scope.

(a) This Part establishes requirements which must be followed during asbestos abatement projects by employers of State and local government employees not covered by the Asbestos Standard of the Occupational Safety and Health Administration (OSHA), 29 CFR 1926.1001, an Asbestos Standard adopted by a State as part of a State plan approved by OSHA under section 18 of the Occupational Safety and Health Act, or a State asbestos regulation in Idaho, Kansas, Oklahoma, and Wisconsin. The rule covers those employees who take part in asbestos abatement work.

(b) [Reserved]

§ 763.121 Regulatory requirements.

(a) *Definitions.* For the purpose of this section:

(1) "Asbestos" means the asbestiform varieties of chrysotile (serpentine); crocidolite (riebeckite); amosite (cummingtonite-grunerite); tremolite; anthophyllite, and actinolite.

(2) "Asbestos abatement project" means any activity involving the removal, enclosure, or encapsulation of friable asbestos material, except removal, enclosure, or encapsulation during sampling or routine repair of less than either 3 linear feet or 3 square feet of friable asbestos material.

(3) "Asbestos fibers" means asbestos fibers longer than 5 micrometers.

(4) "Emergency project" means a project involving the removal, enclosure, or encapsulation of friable asbestos-containing material that was not planned but results from a sudden unexpected event.

(5) "Employer" means the public department, agency, or entity which hires an employee. The term includes, but is not limited to, any State, County, City, or other local governmental entity which operates or administers schools, a department of health or human services, a library, a police department, a fire department, or similar public service agencies or offices.

(6) "Friable asbestos material" means any material containing more than 1 percent asbestos by weight which, when dry, may be crumbled, pulverized or reduced to powder by hand pressure.

(b) *Permissible exposure to airborne concentrations of asbestos fibers.*

(1) [Reserved]

(2) *Standard effective on June 9 1986.* The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed two fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (3) of this section.

(3) *Ceiling concentration.* No employee shall be exposed at any time to airborne concentrations of asbestos fibers in excess of 10 fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.

(c) *Methods of compliance*—(1) *Engineering methods*—(i) *Engineering controls.* Engineering controls, such as, but not limited to, isolation, enclosure, exhaust ventilation, and dust collection, shall be used to meet the exposure limits prescribed in paragraph (b) of this section.

(ii) *Local exhaust ventilation.* (A) Local exhaust ventilation and dust collection systems shall be designed, constructed, installed, and maintained in accordance with the American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, ANSI Z9.2–1979 (Revision of ANSI Z9.2–1971), which is incorporated by reference herein.

(B) ANSI Z9.2–1979 is available for inspection at the Office of the Federal Register Information Center, Rm. 8301, 1100 L St., NW., Washington, DC 20408. This incorporation by reference was approved by the Director of the Office of the Federal Register. This material is incorporated as it exists on the date of approval and a notice of any change in this material will be published in the Federal Register. Copies of the incorporated material may be obtained from the Document Control Officer (TS–793), Office of Toxic Substances, EPA, Rm. 107, 401 M St., SW., Washington, DC 20460, and from the American National Standards Institute, 1430 Broadway, New York, NY 10018 (212–354–3473).

(iii) *Particular tools.* All hand-operated and power-operated tools which may produce or release asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section, such as, but not limited to, saws, scorers, abrasive wheels, and drills, shall be provided with local exhaust ventilation systems in accordance with paragraph (c)(1)(ii) of this section.

(2) *Work practices*—(i) *Wet methods.* Insofar as practicable, asbestos shall be handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet state sufficient to prevent the emission of airborne fibers in excess of the exposure limits prescribed in paragraph (b) of this section, unless the usefulness of the product would be diminished thereby.

(ii) *Particular products and operations.* No asbestos cement, mortar, coating, grout, plaster, or similar material containing asbestos shall be removed from bags, cartons, or other containers in which they are shipped, without being either wetted, or enclosed, or ventilated so as to prevent effectively the release of airborne asbestos fibers in excess of the limits prescribed in paragraph (b) of this section.

(iii) *Demolition or removal.* Employees engaged in removal or demolition of pipes, structures, or equipment covered or insulated with asbestos, and in the removal or demolition of asbestos insulation or coverings shall be provided with respiratory equipment in accordance with paragraph (d)(2)(iii) of this section and with special clothing in accordance with paragraph (d)(3) of this section.

(d) *Personal protection equipment.* (1) Compliance with the exposure limits prescribed by paragraph (b) of this section may not be achieved by the respirators except:

(i) During the time period necessary to install the engineering controls and to institute the work practices required by paragraph (c) of this section;

(ii) In work situations in which the methods prescribed in paragraph (c) of this section are either technically not feasible or feasible to an extent insufficient to reduce the airborne concentrations of asbestos fibers below the limits prescribed by paragraph (b) of this section; or

(iii) In emergencies.

(2) Where a respirator is permitted by paragraph (d)(1) of this section, it shall be selected from among those approved by the Mine Safety and Health

Administration, Department of Labor, the Bureau of Mines, Department of the Interior, or the National Institute for Occupational Safety and Health, Department of Health and Human Services, under the provisions of 30 CFR Part 11 and shall be used in accordance with paragraphs (d)(2) (i), (ii), (iii), and (iv) of this section.

(i) *Air purifying respirators.* A reusable or single use air purifying respirator, or a respirator described in paragraph (d)(2) (ii) or (iii) of this section, shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in paragraph (b) of this section, when the ceiling or the 8-hour time-weighted average airborne concentrations of asbestos fibers are reasonably expected to exceed no more than 10 times those limits.

(ii) *Powered air purifying respirators.* A full facepiece powered air purifying respirator, or a powered air purifying respirator, or a respirator described in paragraph (d)(2)(iii) of this section, shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in paragraph (b) of this section, when the ceiling or the 8-hour time-weighted average concentrations of asbestos fibers are reasonably expected to exceed 10 times, but not 100 times, those limits.

(iii) *Type "C" supplied-air respirators, continuous flow or pressure-demand class.* A type "C" continuous flow or pressure-demand, supplied-air respirator shall be used to reduce the concentrations of airborne asbestos fibers in the respirator below the exposure limits prescribed in paragraph (b) of this section, when the ceiling or the 8-hour time-weighted average airborne concentrations of asbestos fibers are reasonably expected to exceed 100 times those limits.

(iv) *Establishment of a respirator program.* (A) The employer shall establish a respirator program in accordance with the requirements of the American National Standard Practices for Respiratory Protection, ANSI Z88.2-1980 (Revision of ANSI Z88.2-1969), which is incorporated by reference herein.

(B) ANSI Z88.2-1980 is available for inspection at the Office of the Federal Register Information Center, Rm. 8301, 1100 L St., NW., Washington, DC 20408. This incorporation by reference was approved by the Director of the Office of the Federal Register. This material is incorporated as it exists on the date of approval and a notice of any change in this material will be published in the Federal Register. Copies of the incorporated material may be obtained from the Document Control Officer (TS-793), Office of Toxic Substances, EPA, Rm. 107,401 M St., SW., Washington, DC 20460, and from the American National Standards Institute, 1430 Broadway, New York, NY 10018, (212-354-3473).

(C) No employee shall be assigned to tasks requiring the use of respirators if, based upon his most recent examination, an examining physician determines that the employee will be unable to function normally wearing a respirator, or that the safety or health of the employee or other employees will be impaired by his use of a respirator. Such employee shall be rotated to another job or given the opportunity to transfer to a different position whose duties he is able to perform with the same employer, in the same geographical area and with the same seniority, status, and rate of pay he had just prior to such transfer, if such a different position is available.

(3) Special clothing: The employer shall provide, and require the use of, special clothing, such as coveralls or similar whole body clothing, head coverings, gloves and foot coverings for any employee exposed to airborne concentrations of asbestos fibers, which exceed the ceiling level prescribed in paragraph (b) of this section.

(4) Change rooms:

(i) At any fixed place of employment exposed to airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section, the employer shall provide change rooms for employees working regularly at the place.

(ii) Clothes lockers: The employer shall provide two separate lockers or containers for each employee, so separated or isolated as to prevent contamination of the employee's street clothes from his work clothes.

(iii) Laundering:

(A) Laundering of asbestos-contaminated clothing shall be done so as to prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section.

(B) Any employer who gives asbestos-contaminated clothing to another person for laundering shall inform such person of the requirement in paragraph (d)(4)(iii)(A) of this section to effectively prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section.

(C) Contaminated clothing shall be transported in sealed impermeable bags, or other closed, impermeable bags, or other closed, impermeable containers, and labeled in accordance with paragraph (g) of this section.

(e) *Method of measurement.* All determinations of airborne concentrations of asbestos fibers shall be made by the membrane filter method at 400-450x (magnification)(4 millimeter objective) with phase contrast illumination.

(f) *Monitoring*—(1) *Initial determinations.* Every employer shall cause every place of employment where asbestos fibers are released to be monitored in such a way as to determine whether every employee's exposure to asbestos fibers is below the limits prescribed in paragraph (b) of this section. If the limits are exceeded, the employer shall immediately undertake a compliance program in accordance with paragraph (c) of this section.

(2) *Personal monitoring.* (i) Samples shall be collected from within the breathing zone of the employees, on membrane filters of 0.8 micrometer porosity mounted in an open-face filter holder. Samples shall be taken for the determination of the 8-hour time-weighted average airborne concentrations and of the ceiling concentrations of asbestos fibers.

(ii) *Sampling frequency and patterns.* After the initial determinations required by paragraph (f)(1) of this section, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of employees.

(3) *Environmental monitoring.* (i) Samples shall be collected from areas of a work environment which are representative of the airborne concentrations of asbestos fibers which may reach the breathing zone of employees. Samples shall be collected on a membrane filter of 0.8 micrometer porosity mounted in an open-face filter holder. Samples shall be taken for the determination of the 8-hour time-weighted average airborne concentrations and of the ceiling concentrations of asbestos fibers.

(ii) *Sampling frequency and patterns.* After the initial determinations required by paragraph (f)(1) of this section, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of the employees.

(4) *Employee observation of monitoring.* Affected employees, or their representatives, shall be given a reasonable opportunity to observe any monitoring required by this paragraph and shall have access to the records thereof.

(g) *Caution signs and labels*—(1) *Caution signs*—(i) *Posting.* Caution signs

shall be provided and displayed at each location where airborne concentrations of asbestos fibers may be in excess of the exposure limits prescribed in paragraph (b) of this section. Signs shall be posted at such a distance from such a location so that an employee may read the signs and take necessary protective steps before entering the area marked by the signs. Signs shall be posted at all approaches to areas containing excessive concentrations of airborne asbestos fibers.

(ii) *Sign specifications.* The warning signs required by paragraph (g)(1)(i) of this section shall conform to the requirements of 20" x 14" vertical format signs specified in 29 CFR 1910.145(d)(4), and to this paragraph (g)(1)(ii). The signs shall display the following legend in the lower panel, with letter sizes and styles of a visibility at least equal to that specified in this paragraph (g)(1)(ii).

Legend	Notation
Asbestos	1" Sans Serif, Gothic or Block.
Dust Hazard	¾" Sans Serif, Gothic or Block.
Avoid Breathing Dust	½" Gothic.
Wear Assigned Protective Equipment.	½" Gothic.
Do Not Remain in Area Unless Your Work Requires It	½" Gothic.
Breathing Asbestos Dust May be Hazardous To Your Health	14 Point Gothic.

Spacing between lines shall be at least equal to the height of the upper of any two lines.

(2) *Caution labels*—(i) *Labeling.* Caution labels shall be affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, or to their containers, except that no label is required where asbestos fibers have been modified by a bonding agent, coating, binder, or other material so that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section will be released.

(ii) *Label specifications.* The caution labels required by paragraph (g)(2)(i) of this section shall be printed in letters of sufficient size and contrast to be readily visible and legible. The label shall state:

CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
BREATHING ASBESTOS DUST MAY
CAUSE SERIOUS BODILY HARM

(h) *Housekeeping*—(1) *Cleaning.* All internal surfaces in any place of employment shall be maintained free of accumulations of asbestos fibers if, with their dispersion, there would be an excessive concentration.

(2) *Waste disposal.* Asbestos waste, scrap, debris, bags, containers, equipment, and asbestos-contaminated clothing, consigned for disposal, which may produce in any reasonably foreseeable use, handling, storage, processing, disposal, or transportation airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section shall be collected and disposed of in sealed impermeable bags, or other closed, impermeable containers.

(i) *Recordkeeping*—(1) *Exposure records.* Every employer shall maintain records of any personal or environmental monitoring required by this section. Records shall be maintained for a period of at least 20 years and shall be made available upon request to the Environmental Protection Agency, the Assistant Secretary of Labor for Occupational Safety and Health, the Director of the National Institute for Occupational Safety and Health, and to authorized representatives of either.

(2) *Employee access.* Every employee and former employee shall have reasonable access to any record required to be maintained by paragraph (i)(1) of this section, which indicates the employee's own exposure to asbestos fibers.

(3) *Employee notification.* Any employee found to have been exposed at any time to airborne concentrations of asbestos fibers in excess of the limits prescribed in paragraph (b) of this section shall be notified in writing of the exposure as soon as practicable but not later than 5 days of the finding. The employee shall also be timely notified of the corrective action being taken.

(j) *Medical Examinations*—(1) *General.* The employer shall provide or make available at his cost, medical examinations relative to exposure to asbestos required by this paragraph.

(2) *Preplacement.* The employer shall provide or make available to each of his employees, within 30 calendar days following his first employment in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination, which shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches) at the discretion of the physician, a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second ($FEV_{1.0}$).

(3) *Annual examinations.* On or before April 27, 1986, and at least annually thereafter, every employer shall provide, or make available, comprehensive medical examinations to each of his employees engaged in occupations exposed to airborne concentrations of asbestos fibers. Such annual examination shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches) at the discretion of the physician, a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second ($FEV_{1.0}$).

(4) *Termination of employment.* The employer shall provide, or make available, within 30 calendar days before or after the termination of employment of any employee engaged in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination which shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches) at the discretion of the physician, a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second ($FEV_{1.0}$).

(5) *Recent examinations.* No medical examination is required of any employee, if adequate records show that the employee has been examined in accordance with this paragraph within the past 1-year period.

(6) *Medical records*—(i) *Maintenance.* Employers of employees examined pursuant to this paragraph shall cause to be maintained complete and accurate records of all such medical examinations. Records shall be retained by employers for at least 20 years.

(ii) *Access.* The contents of the records of the medical examinations required by this paragraph shall be made available, for inspection and copying, to the Environmental Protection Agency, the Assistant Secretary of Labor for Occupational Safety and Health, the Director of NIOSH, to authorized physicians and medical consultants of either of them, and, upon the request of an employee or former employee, to his physician. Any physician who conducts a medical examination required by this paragraph shall furnish to the employer of the examined employee all the information specifically required by this paragraph, and any other medical information related to occupational exposure to asbestos fibers.

§ 763.124 Reporting.

(a) Employers subject to this rule must report to the Regional Asbestos Coordinator for the EPA Region in which the asbestos abatement project is located at least 10 days before they

begin any asbestos abatement project except one that involves less than either 3 linear feet or 3 square feet of friable asbestos material and is covered by this rule, other than an emergency project. Employers must report any emergency project covered by this rule as soon as possible but in no case more than 48 hours after the project begins. A list of the EPA Regional Offices is given under 40 CFR 1.7(b).

(b) The report must include:

(1) The employer's name and address.

(2) The location, including street address, of the asbestos abatement project.

(3) The scheduled starting and completion dates for the asbestos abatement project.

(c) If a report is mailed to EPA, the report must be postmarked at least 10 days before the asbestos abatement project begins unless the report is for an emergency project. In such a case, the report must be postmarked as soon as possible but in no case more than 48 hours after the project begins.

(d) Employers do not have to report under this section if they submit a notice to EPA under the National Emission Standard for Asbestos, 40 CFR 61.146, at least 10 days before they begin the asbestos abatement project and that notice clearly indicates that employees not covered by the OSHA Asbestos Standard or an Asbestos Standard adopted by a State as part of a State plan approved by OSHA will perform some or all of the asbestos abatement work.

(Approved by the Office of Management and Budget under the control number 2070-0072)

§ 763.125 Enforcement.

(a) Failure to comply with any provision of this Part is a violation of section 15 of the Act (15 U.S.C. 2614).

(b) Failure or refusal to establish and maintain records or to permit access to or copying of records, as required by the Act, is a violation of section 15 of the Act (15 U.S.C. 2614).

(c) Failure or refusal to permit entry or inspection as required by section 11 of the Act (15 U.S.C. 2610) is a violation of section 15 of the Act (15 U.S.C. 2614).

(d) Violators may be subject to the civil and criminal penalties in section 16 of the Act (15 U.S.C. 2615) for each violation.

(e) EPA may seek to enjoin an asbestos abatement project in violation of this Part, or take other actions under the authority of sections 7 of 17 of the Act (15 U.S.C. 2606 or 2616).

§ 763.126 Inspections.

EPA will conduct inspections under section 11 of the Act (15 U.S.C. 2610) to ensure compliance with this Part.

[FR Doc. 86-9190 Filed 4-24-86; 8:45 am]

BILLING CODE 6560-50-M

DEQE Asbestos Regulations

DISCLAIMER

NOTE:

The Massachusetts Department of Environmental Quality Engineering (DEQE) held four (4) hearings in July 1986 on proposed amendments to regulations 310 CMR 7.0, 7.09, and 7.15 for the control of airborne asbestos emissions. Testimony has been received, reviewed, and used to evaluate and change the proposed regulation. A summary has been written and will be made available with the completion of the final regulation. For further information on this regulation contact DEQE - Division of Air Quality Control at 292-5630.

PROPOSAL

The Department of Environmental Quality Engineering, hereinafter called the Department, proposes to revise the Air Pollution Control regulation 310 CMR 7.00 for the purpose of clarifying and changing regulations specific to asbestos. Two definitions under 310 CMR 7.00, subsection (5) of 310 CMR 7.09, and the present two (2) subsections of 310 CMR 7.15 will be deleted. Nine (9) new subsections will be adopted under 310 CMR 7.15. This action is permitted under regulatory authority of the Massachusetts General Laws Chapter 111, Section 142A-142E.

INTRODUCTION

Pursuant to Section 112 of the Clean Air Act, as amended in 1977, the Environmental Protection Agency (EPA) promulgated regulations to curb hazardous air pollutants. Asbestos is one of the hazardous air pollutants regulated by EPA under National Emission Standards for Hazardous Air Pollutants (NESHAP). Current EPA requirements concerning asbestos, under 40 CFR 61, promulgated April 5, 1984, focus on notification, equipment, and work practice standards. The EPA regulations require that "no visible emissions" of particulate asbestos be discharged to the outside air in the process of manufacture, removal, and disposal. Friable asbestos must be "adequately" wetted, bagged, and labelled during removal and disposal. Also, proper installation, use operation, and maintenance of all air-cleaning equipment is required; this includes special fabric filter collection devices.

The Department of Environmental Quality Engineering (the Department) has primary responsibilty for implementing and enforcing asbestos equipment and work practice standards through existing regulations 310 CMR. The Department's Division of Air Quality Control proposed amendments to 310 CMR include deleting two (2) definitions from Section 7.0, deleting subsection (5) of Section 7.09, and modifying Section 7.15 which refer to asbestos emissions, exposure, abatement, and control. These amendments will align the Department's regulations with NESHAP requirements. They will also enhance the Department's ability to meet enforcement responsibilities for protecting public health and welfare.

Contrary to NESHAP, neither the Department's regulations nor the proposed amendments address the manufacturing of asbestos materials or the waste disposal sites for asbestos waste. Industries that use asbestos in the manufacturing process are currently regulated under 310 CMR Sections 7.02, 7.06, and 7.09. These industries are inspected for a number of air pollutants including asbestos.

SUMMARY OF THE PROPOSED AMENDMENTS

I. Definitions 310 CMR 7.15(1)

The Department is proposing to delete two asbestos-related definitions from 310 CMR 7.0 and incorporate the definitions into the regulation under 7.15. Many of the definitions in NESHAP will not be adopted. The Department's proposed definitions will strengthen the implementation and enforcement of the regulation.

II. Applicability 310 CMR 7.15(2)

NESHAP has cut-offs on the amount of asbestos-containing material that requires notification prior to demolitions and renovations. The Department proposes that all facilities containing any amount of asbestos or asbestos-containing material meet the requirements of section (2) and (3), i.e. Notification and Procedures for Asbestos Emissions Control.

III. Standard for Demolition/Renovation: Notification 310 CMR 7.15(3)

Presently under NESHAP, a written notice must be filed with EPA of intent to demolish or renovate a facility. Failure to provide the notice to EPA is in violation of the regulation. The preparer of the notification must fill out the Department approved form and return the form to the appropriate regional office.

The Department approved notice must be postmarked or delivered to the Department at least 20 days before the demolition/renovation operation begins. If a situation calls for an emergency demolition/renovation, the approved form must be postmarked or delivered at least 24 hours prior to the beginning of the emergency operation. The notification time period, however, may be waived at the Department's discretion.

The Department has modified NESHAP's notification requirements to aid in tracking responsible parties in demolitions and renovations. A Department notice form (Data Design Sheet or DDS) shall include, but not be limited to the following:

1) the name, address, and telephone number of the owner and contractor, the transporter(s) and/or transporting company(ies), the refuse transfer station facility owner and facility (if applicable), and the sanitary landfill site owner and the site;

2) the scheduled starting and completion dates of the demolition/renovation, the transportation, the storage at the refuse transfer station facility (if applicable), and the disposal at the sanitary landfill site; and

3) the signature and date of the owner and the contractor.

IV. Standard for Demolition/Renovation: Procedures for Asbestos Emission Control 310 CMR 7.15 (4)

The Department has modified NESHAP's work practice requirements. The proposed requirements include, but are not limited to the folllowing:

1) removal of all asbestos-containing material from a facility before the demolition or renovation operation begins;

2) wetting of any facility component containing asbestos as it is being taken out of the facility as units, sections, or strips; and

3) transport of the facility components to the ground level or lower floor so as to not cause airborne emissions of asbestos.

V. Standard for Demolition/Renovation: Waste Disposal 310 CMR 7.15 (5)

The federal requirements for waste disposal of all asbestos-containing waste material remain the same, however, the order in which they appear has been changed to follow the logical order in which the requirements occur, i.e. no visible emissions, wetting, containment, labelling, storing, and waste disposal.

Storage of asbestos-containing waste material must comply with the Commonwealth's 310 CMR 18.00 Installation, Operation, and Maintenance of Solid Waste Transfer Stations. And disposal of the material at the sanitary landfill sites must be in accordance with 310 CMR 19.00 The Disposal of Solid Wastes by Sanitary Landfill. These citations are stated in 310 CMR 7.15 to highlight compliance requirements.

VI. Air Cleaning 310 CMR 7.15(6)

The Department has adopted the NESHAP requirements for air cleaning. However, the reference in NESHAP to asbestos ore dryers has been deleted from this subsection because it is not applicible to Massachusetts.

The Department is proposing specifications for high efficiency particulate air (HEPA) filtered, power exhaust units which are now commonly used in the asbestos abatement field and widely accepted for operation in demolitions and renovations.

VII. Spraying 310 CMR 7.15 (7)

In 1978, all friable spray-on asbestos material was banned from use by the EPA. NESHAP provided an exception to this rule by allowing spraying if the asbestos was encapsulated in a bituminous or resinous binder during spraying or was not friable after drying.

The proposed amendments prohibit spraying of any facility component with any asbestos-containing material in order to better protect the public health and welfare. The Department questions whether the encapsulation of asbestos with a bituminous or resinous binder prevents release of asbestos into the ambient air.

VIII. Insulating Materials 310 CMR 7.15 (8)

The Department has shortened and clarifed this subsection of NESHAP. It now reads: no owner or operator of a facility may install or reinstall on a facility component any insulation that contains asbestos-containing materials.

IX. Enforcement Provisions 310 CMR 7.15 (9)

In order to expand enforcement of the proposed regulation, this subsection cites 310 CMR 7.52 Enforcement Provisions. Therefore any police department, fire department, board of health, or building inspector or his/her designee acting within his/her jurisdictional area is authorized by the Department to enforce the regulation.

AIR QUALITY IMPACTS

The above amendments will minimize risk to public health and welfare from airborne asbestos emissions. They will increase notification of asbestos demolitions and renovations, and strengthen the work practice and disposal requirements.

ANSI Physical Qualifications for Respirator Use

Appendix C

American National Standard

for respiratory protection – respirator use – physical qualifications for personnel

American National Standards Institute, Inc.
1430 Broadway, New York, New York 10018

ANSI®
Z88.6-1984

American National Standard for Respiratory Protection – Respirator Use – Physical Qualifications for Personnel

Secretariat

Lawrence Livermore National Laboratory

Approved February 21, 1984

American National Standards Institute, Inc

American National Standard

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Foreword

(This Foreword is not part of American National Standard Z88.6-1984.)

Rules and regulations for many kinds of employment require the use of respirators by personnel, provided that clearance by a physician for such respirator use is obtained by each employee. The examiner needs to know of any specific physical demands upon the individual, the type of activity to be performed, and the characteristics of the work environment. In the past, no practical guidelines have been offered to assist a physician in making this determination.

This standard is meant to identify responsibilities of the physician, the employee, and management in determining the employee's ability to use the respirator.

Denial of permission to wear a respirator may have serious effects on employability. Relatively few nondisabling medical conditions make respirator use dangerous, especially for employees who briefly or occasionally need the respirator to perform their tasks. In instances in which an employee's health may be endangered by wearing a respirator, the physician should consider appropriate work restrictions, but may permit limited use, based on consultation with supervisory or safety personnel.

In 1981, American National Standards Committee for Safety Standards for Respiratory Protection, Z88, brought together people knowledgeable in the physical and psychological requirements for proper respirator use and formed Subcommittee Z88.6 on Physical Qualifications for Respirator Use. The subcommittee was to write a standard that would provide more detailed guidance to assist physicians in determining which individuals should and should not be assigned to wear respirators. The members of the subcommittee pooled the necessary information from their own expertise and sent copies of the drafts of the manuscript to other interested parties for their opinions and comments.

This standard contains general, rather than specific, requirements because it is the first standard to deal with this subject. However, it is intended that more specific requirements, recommended by industry and government after using this standard, will be provided in future editions.

Suggestions for the improvement of this standard will be welcome. They should be sent to the Lawrence Livermore National Laboratory, Bruce J. Held, Leader, Industrial Hygiene and Toxicology Group, P.O. Box 5505, L-384, Livermore, Calif. 94550.

This standard was processed and approved for submittal to ANSI by American National Standards Committee on Respiratory Protection, Z88. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the Z88 Committee had the following members:

Bruce J. Held, Chair
Jerry W. Stengel, Vice-Chair
Donald P. Wilmes, Secretary

Organization Represented	*Name of Representative*
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Individual Members
J. Cooper
J. Holthouser
H. Ritchie

Subcommittee Z88.6 on Physical Qualifications for Respirator Use, which developed this standard, had the following members:

John H. Spickard, M.D., Chair

Clark Cooper, M.D.
David P. Discher, M.D.
A. Seaton Garrett, Jr, M.D.
R. L. Johnson, M.D.
Peter Raven, M.D.
Bruce Reinert
John I. Smith, M.D.

Contents

American National Standard for Respiratory Protection – Respirator Use – Physical Qualifications for Personnel

1. Scope and Purpose

1.1 Scope. This standard establishes guidelines for medical examination of personnel required to use respirators.

1.2 Purpose. This standard provides guidance and information for examining physicans or other professionals to assist them in determining the suitability of personnel for respirator use. It identifies the responsibility of management to provide the physicians with information concerning types of respirator, special physical demands, and environmental conditions related to the respirator use. Examiners shall use their judgment in application of these guidelines and require additional information or evaluation as necessary to permit certification or classification for respirator use.

2. Definitions

field testing. Evaluation of performance by an individual while wearing a respirator during actual or mock-up conditions. This generally would be performed only after physical evaluation and fit testing (see definition) to resolve any questionable areas of suitability for respirator use.

fit testing. Evaluation of sealing characteristics and performance of the respirator user under controlled conditions. Vapors and chambers shall be utilized as indicated.

other professionals. Qualified persons, including nurses, industrial hygienists, and safety engineers, who by the nature of their training or experience can function effectively with the guidance of a physician, in accordance with applicable federal or state regulations.

shall. The word "shall" as used in this standard is to be understood as denoting a mandatory requirement.

should. The word "should" as used in this standard is to be understood as denoting a recommendation that is a sound safety practice; it does not denote a mandatory requirement.

3. Respirator Characteristics

3.1 Air-Purifying Respirators (Not approved for fire-fighting efforts)

3.1.1 Air-Purifying (Nonpowered) Respirators. Inhalation through the filtering media and exhalation through the valve are provided by lung power only. Inhalation resistance shall be tested at 85 L/min, and ranges from 30 mm to 50 mm H_2O for particulate filter respirators to as much as 85 mm for a gas mask that removes gas as well as particulates.

3.1.2 Powered Air-Purifying Respirators. Powered units contain a blower to move the air through the filtering media. Inhalation and exhalation resistance is negligible, similar to a continous-flow air-line device. The weight of the blower varies from approximately 5 pounds to 15 pounds.

3.2 Atmosphere-Supplying Respirators

3.2.1 General. Atmosphere-supplying respirators are divided into air-line and self-contained versions. The self-contained breathing apparatus (SCBA) is completely portable. The air-line apparatus requires the trailing of an air hose from the wearer to the source of breathing air.

Continuous-flow respirators blow air continuously into the mask. Demand-type apparatuses require the wearer to inhale and reduce the mask pressure below atmospheric pressure before the regulator will supply air. This operation is similar to inhaling on an air-purifying device. In a pressure-demand (positive-pressure) device, a slight positive pressure is maintained in the facepiece at all times by the regulator. Exhalation resistances are greater than for demand devices.

3.2.2 Open-Circuit SCBA. Open-circuit SCBA is available in demand or pressure-demand devices. In open-circuit devices, breathing air is supplied from a cylinder to the mask, and then dumped into the atmosphere on exhalation. The nitrogen in the breathing air is excess weight that does not contribute to the wearer's metabolism. The maximum allowed weight is 35 pounds, although modern half-hour units may weigh 10 pounds less. Significant reduction (up to 20%) in work capacity of the wearer can occur since

the 35-pound load must be carried. Heavy work rates may be required during fire-fighting and rescue situations while wearing SCBA. Regulators on current SCBA do not supply the high instantaneous demands of wearers at high rates, and so may impair work output further. The increased exhalation resistance of pressure-demand units may also degrade ability to perform heavy work.

3.2.3 **Closed-Circuit SCBA.** Closed-circuit SCBA is available in demand or pressure-demand devices. In closed-circuit units (also known as rebreathers), oxygen is supplied from a compressed gas, liquid, or chemical source. Exhaled air is scrubbed of carbon dioxide and returned to the facepiece. Closed-circuit devices have a longer duration for their weight than do open-circuit equipment. Breathing is into and out of a bag rather than from a regulator. Temperature of the inhaled air (except in liquid oxygen apparatuses) is higher than 120°F. Oxygen concentrations may range from 21 percent to 90 percent.

3.2.4 **Supplied-Air Respirators.** Supplied-air respirators are available in either continuous-flow, demand, or pressure-demand devices. All supplied respirators require a trailing air hose that limits moving about the workplace. Duration of use is limited only by the air source and the metabolic work rate. Exhalation resistance is equal to or lower than that of demand equipment (the exhalation valve being held open by the continuous outward flow of air). Demand and pressure-demand versions of air-line units have similar physiological effects as SCBA, except for the additional weight burden of the SCBA.

4. Examination Requirements

4.1 The industrial hygienist, safety engineer, or other management representative shall provide the examiner with meaningful work-related information to assist in the examination (see 4.1.1 through 4.1.5). A special report form may be utilized (See Appendix B).

4.1.1 The type of respiratory protection to be used should be documented. Any special characteristics of a respirator should be identified to the physician.

4.1.2 The level of effort required should be identified. Such terms as light, moderate, heavy or strenuous, and sustained effort may be used.

4.1.3 Extent of usage should be defined in one of these three ways:

(1) On a daily basis (if so, how many hours a day)

(2) Occasionally, but probably more than once weekly (as in maintenance worker)

(3) Rarely or for emergency situations only

4.1.4 Special responsibilities should be defined such as individuals who have responsibility for the safety of others and consequently may be expected to have special physical capabilities. This would include rescue workers, fire fighters, security personnel, and the like.

4.1.5 Other special environmental conditions (i.e., excessive heat, seriously confined space usage) should be identified. Additional requirements for protective clothing should also be listed.

4.2 Based on this examination and the information provided, the examining physician shall certify whether the individual is permitted to use a respirator under the circumstances described. In most situations, the severity of the physical exercises shall be the limiting factor and not the special characteristics of the respirator.

4.2.1 The physician shall classify the examinee in a category as follows:

(1) *Class 1:* No restrictions on respirator use.

(2) *Class 2:* Some specific use restrictions. These restrictions should be identified to permit decision by the supervisor or safety representative for determining suitability for the specific task.

(3) *Class 3:* No respirator use under any circumstances. The reason should not be identified on the report to the supervisor or to the safety department or other group responsible for the respirator program.

4.2.2 In addition to the classification for respirator use, the report to the safety officer or to the supervisor should include other work limitations or restrictions not necessarily related specifically to respirator use.

5. Medical History

5.1 A medical history questionnaire should be utilized to identify the following (See Figure B3, for example):

(1) Previously diagnosed disease, particularly stressing known cardiovascular or respiratory diseases

(2) Psychological problems or symptoms including claustrophobia

(3) Problems associated with breathing during normal work activities

(4) Past problems with respirator use

(5) Past and current usage of medication

(6) Any known physical deformities or abnormalities, including those which may interfere with respirator use

(7) Previous occupations

(8) Tolerance to tachycardia produced by inhalation of heated air

5.2 At subsequent examinations, this information should be reviewed and updated.

5.3 Conditions disqualifying personnel for respirator use can often be identified by questionnaire. In instances where a complete examination is not warranted, because other medical information is available, the questionnaire may be used in determining suitability of individuals for fit testing, depending upon the physician's assessment of the specific situation.

6. Medical Examination

6.1 Frequency. The frequency of the examination shall be established upon recommendations of the physician and as required by federal and state legislation. A recommended guideline for frequency would be every 5 years below age 35, every 2 years up to age 45, and annually thereafter. Special evaluations shall be performed after prolonged absences from work for medical reasons or whenever a functional disability has been identified.

6.2 General Considerations. The physician's evaluation of suitability of the individual examinee for respirator use shall be based on perception of the work ability of the individual and not based specifically on a diagnosis.

6.3 Specific Disqualifying Conditions. The following conditions shall be considered disqualifying:

(1) *Facial Deformities and Facial Hair.* Facial deformities or presence of excessive hair or other conditions that interfere with proper sealing of the respirator shall disqualify the applicant. Questionably disqualifying conditions shall be evaluated by fit testing.

(2) *Use of Prescription Eyeglasses or Contact Lenses.* Individuals with prescription eyeglasses who are required to wear a full-face respirator shall use special frames for their glasses that do not interfere with the facepiece seal. Special visual acuity and visual field requirements shall depend upon the nature of the work to be performed. Contact lenses should not be permitted for respirator use. The examining physician shall determine whether the use of contact lenses by the employee will interfere with the proper use of the respirator and thus affect the work performance of that employee. In making this decision, the examining physician shall consider (1) the type of respirator the contact lens wearer will use,[1] (2) the hazards of the work environment,[2] (3) the applicability of federal or state regulations, and (4) the appropriate fit and field testing.

(3) *Hearing Requirements.* These requirements shall be dependent upon the nature of the work to be performed. The employee's hearing shall be adequate to ensure communication and response to instructions and alarm systems. Individuals with perforated tympanic membranes cannot wear respirators in hazardous areas where inhalation or absorption of toxic materials or vapors through the perforation may occur. Existence of perforation by itself shall not immediately disqualify the employee from respirator use, but the physician shall consider both the environmental conditions of the job and possible specific safety controls before reaching a final decision. Possible specific safety controls may also be recommended by the safety personnel.

(4) *Respiratory Diseases.* Diseases affecting pulmonary function may prevent respirator use. Significant restrictive or obstructive disease or perfusion disorders may preclude approval for use. Assessment as to the degree of disability shall depend upon the patient's history and clinical findings or x-ray and spirometry, where indicated. Special analysis shall be required when perfusion disorders are suspected.

(5) *Cardiovascular Diseases.* Symptomatic coronary artery disease, significant arrhythmias, or history of recent myocardial infarction shall disqualify the employee from respirator use. Occurrence of frequent premature ventricular contractions (PVCs) with elevated pulse rates shall be considered disqualifying. The examining physician, using clinical judgment, shall decide if individuals with uncontrolled hypertension or related symptoms and individuals on blood pressure or cardiovascular medications may wear respirators.

(6) *Endocrinal Disorder.* General work limitations and restrictions identified for other work activities also shall apply for respirator use. If the employee may suffer sudden loss of consciousness or response capability, the physician shall determine if the employee may use a respirator.

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[1] Requirements in American National Standard Practices for Respiratory Protection, ANSI Z88.2-1980, and in American National Standard Practices for Respiratory Protection for the Fire Service, ANSI Z88.5-1981, prohibit wearers of contact lenses from wearing all types of respirators. These requirements were based on the common knowledge of the members of the Z88.2 and Z88.5 subcommittees. The Occupational Safety and Health Administration (OSHA) adopted a similar restriction. In 1983, OSHA began a study to determine whether the wearing of contact lenses constitutes a hazard for the wearer of a respirator. This study had not been concluded at the time of publication of this standard.

[2] In ANSI Z88.5-1981, fire fighters are prohibited from using respirators if they are wearing contact lenses because of the possibility of vision impairment due to dust getting caught behind the lens or the lens falling out of the eye during a fire. This restriction was based on the common knowledge of the Z88.5 Subcommittee. The OSHA study that began in 1983 is also examining the validity of this restriction. The study had not been concluded at the time of publication of this standard.

(7) *Neurological Disability.* Inability to perform coordinated movements and conditions affecting response and consciousness shall disqualify the employee. Epilepsy, controlled on medication, should not be disqualifying if the patient has been seizure-free for 1 year and has no significant side effects from medication.

(8) *Medications.* The examining physician shall use clinical judgment to determine if an individual should be denied use of a respirator due to a history of excessive use or problems related to prescription and non-prescription drugs, including alcohol, that affect judgment, performance, or reliability or alter the state of awareness or consciousness.

(9) *Psychological Condition.* The physician shall decide if an employee with a psychological condition that results in poor judgment or reliability should be disqualified. A history of claustrophobia may disqualify the employee. The physician shall consider the severity of the examinee's claustrophobia, and may recommend field testing for the examinee, prior to approving or denying use of the respirator. Clinical history or indication of severe anxiety shall also be considered by the physician in determining an individual's ability to use respirators.

6.4 Miscellaneous. To ensure the safety of the employee, the physician shall designate work restrictions that are based on the person's medical history or current health condition and not related specifically to respirator use. Conditions that might require special restrictions or placement shall include history of heat stroke or heat exhaustion and skin conditions in cases where occlusive materials may result in symptoms or aggravation of the preexisting dermatitis.

7. Special Testing

7.1 **Spirometry.** Where available, spirometry may be used to screen individuals if information is needed in addition to the clinical examination by the physician. An indication of status, at least for incidental respirator use, can be based upon the *forced vital capacity* (FVC) and the *forced expiratory volume – 1 second* (FEV_1). If the FVC is less than 80 percent or the FEV_1 is less than 70 percent, restriction from respirator use should be considered. If the work activities are not strenuous and history and physical findings do not indicate problems with performance in a respirator, then fit testing and field testing should be performed.

For individuals performing extensive respirator work requiring heavy or strenuous exertion, additional evaluation may be necessary, including calculation of a *maximum voluntary ventilation – 15 second* ($MVV_{0.25}$). Application of this test is further described in Appendix A.

For accurate assessment, spirometry should not be performed if the subject is acutely ill from any cause, has smoked or used an aerosol bronchodilator within the past hour, or has a significant upper or lower respirator tract infection.

7.2 Exercise Stress Test. A maximum exercise stress test may be recommended by the examining physician for personnel who use SCBA or rebreather-type respirators under strenuous work effort. Individuals who have apparent ischemic disease or cannot perform well on a treadmill because of respiratory, musculoskeletal, or other physical problems should not be assigned to emergency brigades or other positions where use of SCBA or rebreathing devices is required.

Appendixes (These Appendixes are not part of American National Standard Z88.6-1984, but are included for information only.)

Appendix A

Additional Spirometry Testing

The 15-second maximum voluntary ventilation ($MVV_{0.25}$) may be the test of choice for evaluating work capacity of frequent users of industrial respirators. This test has been shown to be directly related to lung and chest wall mechanics, as well as respiratory muscle fatigue. It is directly related to sustained maximum exercise ventilation and can be corrected for respirator resistance and used as a screening test.[3] This test is inexpensive and can be conducted in the physician's office, but should be performed by a trained technician. The $MVV_{0.25}$ test should be performed at a breathing frequency of 40 breaths per minute in a standing position. Tidal volumes of each breath should approximate 2/3 of the vital capacity. All spirometry volumes should be corrected to Body Temperature and Pressure Saturated (BTPS). The conversion formula in Figure B1 is necessary to correct for the effect of cooling of the expired air (37°C) to room temperature. This correction usually increases the volume recorded by the spirometer by approximately 8 percent. Some manufacturers incorporate an automatic correction factor in their test devices.[4] Maximum tolerable steady state exercise ventilation has been calculated at 64 percent of the $MVV_{0.25}$; 50 percent of the $MVV_{0.25}$ can be sustained indefinitely. Calculation of the $MVV_{0.25}$ will permit some determination of requirements while wearing certain demand-type respirators as depicted in Figure A1.

[3] Raven, P. B.; Moss, R. F.; Page, K.; Garmon, R.; Skaggs, R. Clinical pulmonary function and industrial respirator wear. American Industrial Hygiene Association Journal. 42: 897–903; 1981 December.

[4] Division of Training and Man-Power, NIOSH. Manual of spirometry in occupational medicine. Cincinnati, Ohio: National Institute of Occupational Safety and Health; 1981 November: Page 22.

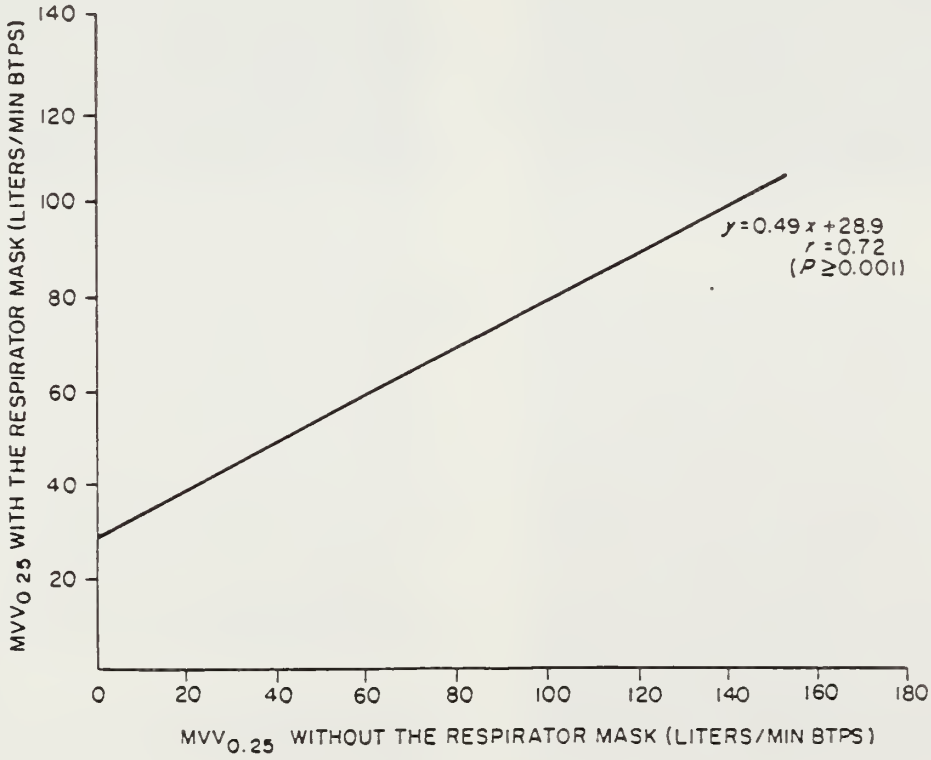

Figure A1
The Relationship between $MVV_{0.25}$ Measured with and without the Respirator Mask (Adjusted Ventilation)

Appendix B

Recommended Questionnaires

In facilities where this form of evaluation is utilized to determine suitability for respirator use, special forms for request for clearance by the safety representative and for evaluation by the examiner might be suitable. In addition, a laboratory form might prove useful. Recommended copies of proposed forms are shown in Figures B1 through B3.

Lab Form
MVV Assessment

_____ _____ _____

Patient Age Height

$MVV_{0.25}$ _____ L/min Corrected (BPTS) _____ L/min

Adjusted ventilation (AV) _____ L/min

General formula:* Adjusted Ventilation = 0.49 X $MVV_{0.25}$ + 29 L/min
where $MVV_{0.25} > 50$ L/min.

Short-term (< 1 hr) vent. (0.70 X AV) _____ L/min _____
Rating

Long-term (1-8 hrs) vent. (0.50 X AV) _____ L/min _____
Rating

Rating Schedule

Rating	Ventilation (L/min)
1. Light work	6-15
2. Moderate work	15-25
3. Heavy work	25-40
4. Very heavy work	40-60
5. Extremely heavy work	60-90
6. Exhaustive work	90-120

*Alternate formula: The modification shown in the following table may be applied to the general formula:

$MVV_{0.25}$ Value (L/min)	Reduce $MVV_{0.25}$ Term by (%)
>160	35
159-100	30
99- 50	20

Figure B1
Example of the Lab Form (MVV Assessment)

Request for Medical Clearance for Respirator Use Questionnaire

_____	_____	_____
Employee	Social Security Number	Date of Birth

_____	_____
Supervisor	Department

Circle Type or Types of Respirator(s) to be Used:

Atmosphere-supplying respirator	Continuous-flow respirator
Open-circuit SCBA	Closed circuit SCBA
Supplied-air respirator	Combination air-line and SCBA
Air-purifying (nonpowered)	Air-purifying (powered)

Level of Work Effort (Circle one):

Light Moderate Heavy Strenuous

Extent of Usage:

1. On a daily basis
2. Occasionally — but more than once a week
3. Rarely — or for emergency situations only

Length of Time of Anticipated Effort in Hours: _____

Special Work Considerations (i.e., high places, temperature, hazardous material, protective clothing, etc.) _____

_____

_____

_____

_____

Safety Representative

PHYSICIAN'S EVALUATION _____

Employee

CLASS: (Circle)
1. No restrictions on respirator use
2. Some specific use restrictions
3. No respirator use permitted

Restrictions: _____

_____

_____

_____

Examining Physician

Figure B2
Example of the Request for Medical Clearance for Respirator Use Questionnaire

Medical Questionnaire for Respirator Users

Name _____ Social Security No. _____

Employer _____ Area Supervisor _____

Date _____ Age _____ Height _____ Weight _____

Have you ever worn a respirator before? _____ YES _____ NO

If YES, describe any apparent difficulties noted with respirator use: _____

_____

_____

Have you had or do you now have any of the following:	YES*	NO
1. Lung disease	1. _____	_____
2. Persistent cough	2. _____	_____
3. Heart trouble	3. _____	_____
4. Shortness of breath	4. _____	_____
5. History of fainting or seizures	5. _____	_____
6. High blood pressure	6. _____	_____
7. Diabetes	7. _____	_____
8. Fear of tight or enclosed places	8. _____	_____
9. Sensation of smothering	9. _____	_____
10. Heat exhaustion or heat stroke	10. _____	_____
11. Ruptured ear drum	11. _____	_____
12. Defective vision	12. _____	_____
13. Defective hearing	13. _____	_____
14. Contact lenses or glasses	14. _____	_____
15. Other conditions that might interfere with respirator use or result in limited work ability	15. _____	_____
16. Are you taking any medications?	16. _____	_____

*Please explain YES answers _____

_____

_____

_____

Employee Signature

Figure B3
Example of the Medical Questionnaire for Respirator Users

Appendix C

Areas of Future Investigation

Upon future revision of this standard, the following areas will receive detailed attention and review:

(1) Methods of achieving greater standardization and strengthening of medical pass/fail requirements

(2) Distinction between "medical examination" terminology used and other annual medical reviews

(3) Clarification of use of "previous occupations" information

(4) Specific conditions for worker disqualification

(5) Instances where a medical exam is not required

(6) Disqualifications due to hearing, blood pressure, and medication

(7) Possible elimination of chest x-ray requirement

(8) Heavy work limitations and stress testing

(9) "Emergency Use Only" class of users

(10) Statement on facial hair

(11) Skin rash problems

Sample Bid Specifications for

Asbestos Removal Work

Appendix D

The Commonwealth of Massachusetts

Executive Office of Labor

Department of Labor and Industries

Division of Occupational Hygiene

1001 Watertown Street

West Newton 02165

RICHARD LEVINE
Director

Minimum Specifications For Asbestos Abatement Projects Eligible for Reimbursement Under -- Chapter 614 of the Acts of 1985

Introduction

The purpose of these specifications is to ensure that asbestos abatement operations reimbursed under Chapter 614 will be executed in a safe and effective manner. Awarding authorities should be advised that once the contractor leaves the job site there are currently no regulations protecting building owners. To ensure proper cleanup performance by the contractor, the awarding authority should provide the contractor with definitive job specifications for asbestos related work. In addition bonding is desirable to ensure appropriate compliance with the contract and completion within the scheduled time period. It is also recommended that complete payment for the contracted asbestos abatement work be withheld until the criterion of "no visible debris" and 0.01 fibers/cc (total fiber count) as measured at the final clearance air monitoring are achieved. Reimbursement under Chapter 614 is contingent on final approval by the Division of Occupational Hygiene and the Department of Education.

I. General Requirements

1. All asbestos abatement projects will have written job specifications.
2. Only those proposed asbestos abatement projects which conform to the specifications set forth herein shall be considered eligible for reimbursement under Chapter 614.
3. All proposed asbestos abatement projects shall be subject to inspection and approval of the Division of Occupational Hygiene prior to the commencement of the project. All proposed asbestos abatement projects which in the opinion of the Division will not result in the desired abatement of an asbestos hazard or are otherwise inadvisable, will not be eligible for reimbursement under Chapter 614.
4. For asbestos abatement projects which have been completed or are in progress prior to the issuance of these specifications, but are otherwise in conformance with these specifications, written documentation of conformance must be submitted to the Division of Occupational Hygiene before eligibility for reimbursement will be considered.

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APPROVED BY:Daniel Carter, State Purchasing Agent

5. Requests for exemptions or variances to these specifications for certain conditions (such as - abatements of small quantities of asbestos, spot repairs, or when the glovebag technique is used exclusively) must be submitted in writing prior to commencement of the work.
6. If alternative work practices, protective equipment, or standards have been used for asbestos abatement projects which have been completed or are in progress prior to the issuance of these specifications it must be demonstrated in writing that these work practices, equipment and/or standards provided a level of worker and area protection equivalent to or greater than the specifications set forth herein.

II. Awarding of Contracts

All statues regulating competitive bidding and construction contracts for public buildings and public works projects as set forth in Chapter 149 of the Massachusetts General Laws will be upheld.

III. Applicable Regulations

It is assumed that the asbestos abatement specifications and the work performed under those specifications will conform and comply with all the requirements of the following regulations:

1. USEPA Regulations for Asbestos, CFR, Title 40, Part 61, Subpart M National Emissions Standards for Hazardous Air Pollutants (NESHAPS)
2. USEPA Regulations for Asbestos, Asbestos Abatement Projects, CFR, Title 40, Part 763, Subpart G
3. US Department of Labor, Occupational Safety and Health Administration (OSHA) Asbestos Regulations, CFR, Title 29, Part 1910, Section 1001
4. Massachusetts Department of Environmental Quality Engineering Regulations 310 CMR 7.00

IV. Notifications:

1. Pursuant to NESHAPS requirements (40 CFR, Part 61, Subpart M) the contractor will provide appropriate written notification at least ten (10) days or twenty (20) days depending on the amount of asbestos to be abated prior to the start of the asbestos abatement activity to:

   Regional Asbestos Coordinator
   USEPA
   JFK Federal Building
   Boston, MA 02203

2. At least twenty (20) days prior to the start of the asbestos abatement activity the contractor shall provide appropriate written notification to:

The Massachusetts Department of Environmental
Quality Engineering
Division of Air and Hazardous Materials
(appropriate regional office)
or
Department of Environmental Quality Engineering
Office of Public Affairs
One Winter Street
Boston, MA 02108

3. At least ten (10) days prior to the start of the asbestos abatement activity the contractor shall provide appropriate written notification to:

   The Massachusetts Division of Occupational Hygiene
   1001 Watertown Street
   West Newton, MA 02165

4. Local Notification Requirements - as applicable.

V. Protective Clothing and Equipment

1. The contractor shall provide approved respirators (see Section VI Respiratory Protection) and protective clothing to all workers, and to all official representatives of the owner, state or other governmental entity, and the architect/engineer who may inspect the job site.
2. Full body disposable protective clothing, including head, body, and foot coverings consisting of material impenetrable by asbestos fibers (Tyvek^{R} or equivalent) shall be provided to all workers and authorized visitors.
3. Non-skid footwear shall be provided to all abatement workers. Disposable clothing shall be adequately sealed to the footwear to prevent body contamination.
4. All electrical cords and connections shall be fitted with ground fault interruptors.
5. Eye protection and hard hats shall be provided as appropriate.

VI. Respiratory Protection

1. All persons at the work site who are potentially exposed to asbestos (workers and visitors) shall be provided with MSHA or NIOSH-approved respirators.
2. The minimum respiratory protection will be the half-face, dual cannister air purifying respirator with HEPA filters.
3. The level of respiratory protection to be provided shall be determined, in part, through the use of a respirator program, which shall have been established in accordance with OSHA Asbestos Regulations 29 CFR 1910.134 and 29 CFR 1910.1001. The written particulars of said respirator program shall be available for inspection at the work site.
4. Where respirators with disposable filters are utilized, a stock of new filters shall be available for use at the job site. Filters shall be changed at least once in each 8-hour period or according to manufacturer specifications.
5. Respirators will be cleaned and maintained according to manufacturers instructions.

6. All respirators shall be properly fit tested. Bearded workers or visitors will wear full face powered air or hooded respirators.

VII. Security Program

1. The work site will be closed to the public. A security system must be established so that only authorized personnel can enter the asbestos job site.
2. The work area shall be placarded with asbestos hazard signs in accordance with OSHA Regulations 29 CFR, 1910.1001.
3. Emergency exits shall be maintained, or alternate exits provided, during the asbestos abatement operation.

VIII. Work Procedures and Practices

1. Before abatement operations are commenced all moveable objects will be removed from the work area. All objects shall be HEPA vacuumed or wet cleaned prior to their removal.
2. Isolation and containment of the work area shall be accomplished by completely sealing off all openings and fixtures, including but not limited to: ventilation ducts, doorways, corridors, windows, electrical conduits, and lights with 6-mil (minimum) plastic sheeting securely taped in place.
3. All building surfaces within the containment area shall be covered with 6-mil (minimum) plastic sheeting securely taped in place. All articles left inside the containment barrier must be completely sealed with plastic sheeting so as to prevent contamination.
4. A decontamination facility shall be contructed and used as the sole entry and egress to the work area for the duration of the removal operations. This facility should be integral with the work area and constructed with framing materials and plastic sheeting (6-mil; minimum) in such a manner as to create three separate compartments as described below. These compartments should be separated from each other by overlapping double-thickness plastic sheeting. The entire facility should be tightly constructed and sealed so as to prevent air leakage. The compartments beginning with the one closest to the work area are:

    a. Equipment and Access Area: This area is designated for equipment storage and access to the work space. Workers must remove all protective clothing, except for their respirators in this area. All surfaces shall be covered with polyethylene as described for the work space.
    b. Shower Room: Workers will remove respirators and shower in this area. Showers must have both hot and cold water.
    c. Clean Room: This area is to be kept free from asbestos contamination. All street clothes must be kept in the confines of this space. At the beginning of the work cycle, workers will change into clean protective clothing in this area. At the end of the work cycle, workers dress in this area after showering.

5. HEPA-filtered, powered exhaust units will be used to maintain a negative air pressure in the containment area throughout the work

operation. The number and capacity of such units will be sufficient to provide a minimum of four air changes per hour within the containment area. Each unit should be equipped with Magnehelic guage or manometer and an audible alarm to indicate filter plugging or unit malfunctioning. Units will be operated in accordance with USEPA recommendations (As specified in Appendix J of USEPA Guidance Document EPA 560/5-85-024) Spare HEPA filters and prefilters will be available for use at the job site. Discarded filters will be disposed as asbestos waste. Units will run continuously during the removal operation (except during clearance air sampling). Discharge of the negative air pressure units will be to the outside of the building.

6. The handling, renovation and/or removal of asbestos must be confined to the containment area. Before asbestos material is handled it shall be sprayed with water amended with an appropriate surfactant. The material shall be sufficiently saturated to prevent excessive dispersal of asbestos fibers. Wetting shall be repeated as often as necessary to maintain the wet condition of the material. In no case shall removed asbestos material and debris be allowed to accumulate, but it shall be picked up and placed in appropriate containers on a continuing basis.
7. All asbestos and asbestos-contaminated waste material shall be double-bagged wet in polyethylene bags (6-mil minimum thickness) or placed in leak-tight drums. Bags and drums of asbestos waste are to be sealed, labelled, transported, and disposed of in accordance with all applicable OSHA and EPA regulations. At the conclusion of the job all polyethylene materials, tape, cleaning material, and clothing will be bagged and treated as asbestos waste.
8. All equipment shall be wet cleaned or HEPA vacuumed prior to removal from the containment area.
9. If, at any time, air monitoring (see Section XI, Air Monitoring) shows that areas outside the containment area have fiber concentrations in excess of 0.04 fiber/cc (or above pre abatement baseline readings - whichever is greater) affected areas must be contained, maintained, and cleaned in the same manner as the work space.

IX. Personal Hygiene

All workers without exception shall:

1. Remove street clothes in the clean room and put on disposable coveralls, footwear and respirators before entering the work area.
2. Refrain from eating, drinking, or smoking in the work area.
3. Remove disposable work clothes and footwear before exiting the work area. Still wearing respirators workers shall proceed to the showers. Respirators shall be removed while showering with soap and water. After showering workers shall enter the clean change area and don street clothes or new coveralls.
4. Leave disposable footwear inside the work area until the completion of the job. Such footwear will then be disposed as asbestos waste or thoroughly cleaned.

X. Cleanup and Area Clearance

1. Subsequent to the completion of all asbestos abatement work the work area shall be cleaned to a condition of no visible debris and a total airborne fiber concentration of 0.01 fibers/cc or less (as measured by the NIOSH Analytical Method # P and CAM 239 or NIOSH Analytical Method 7400).
2. Wet cleaning methods (sponging and mopping) shall be utilized to acheive a condition of "no visible debris" in the work area.
3. Sealed bags or drums of asbestos debris shall be wet-cleaned and removed through the decontamination facility.
4. HEPA vacuuming should be used to thoroughly clean dry surfaces.
5. After initial cleaning, the containment area should be inspected by an agency or individual knowledgeable and qualified in asbestos clearance testing procedures and who is not affiliated in any way with the contractor performing the abatement work. A finding of "no visible debris" constitutes a satisfactory finding. The area must be repeatedly recleaned until this finding is met.
6. Following visual inspection and when surfaces within the containment area are dry, post abatement (clearance) air monitoring shall be used to confirm that the containment area has been adequately cleaned. Using aggressive air sampling methods a sufficient number of air samples shall be collected so as to determine post abatement fiber concentrations within each containment area. There shall be a minimum of two clearance samples for each containment area (or no fewer than 2 clearance samples for each 10,000 square feet in a single contained area). The volume of air sampled shall be sufficiently large to permit a quantification limit of 0.01 fibers/cc or less (assuming a 10 fiber, 100 fields limit of reliable quantification, see USEPA Guidance Document 560/5-85-024, Appendix M).
7. The contractor shall not be released and the area declared clean until all post abatement air samples inside the containment are 0.01 fibers/cc of air or less as measured by the NIOSH Analytical Method # P and CAM 239 or NIOSH Analytical Method 7400. Until the condition is reached the containment area shall be repeatedly cleaned and sampled.

XI. Air Monitoring

1. Air monitoring shall be conducted by an individual or agency suitably equipped and with specialized experience in air sampling for asbestos. The air monitoring individual or agency shall not be hired by the contractor performing the abatement work.
2. Methods of air sampling and fiber counting will generally be as prescribed by the Standard NIOSH Analytical Method # P and CAM 239 or NIOSH Analytical Method 7400.
3. A sufficient number of air samples shall be collected so as to determine with reasonable accuracy the levels of exposure of workers (in accordance with OSHA 1910.1001) and the levels of building contamination in affected areas. These shall generally include:

A. Pre-abatement sampling - A sufficient number of air samples from outside the work area shall be collected prior to the start of abatement activities to determine existing airborne fiber levels under normal activity conditions. In lieu of pre abatement sampling outside the work area the contractor may elect to accept 0.04 fibers/cc as being the maximum pre-abatement background level.

B. Sampling during abatement - The following schedule of air samples shall be required once abatement activities begin.

   Area Samples (outside containment) - At least two area samples from spaces outside of the work area containment shall be taken on a daily basis. One of these samples shall be taken at the entrance of the decontamination facility.

   Personal Samples (inside containment) - The number and frequency of these shall be in accordance with the requirements of OSHA 1910.1001.

C. Post-abatement (clearance) - Once the "no visible debris" criterion has been met, a sufficient number of samples shall be collected (using agressive sampling) to determine post-abatement air concentrations. An adequate sample volume of air, so as to provide accuracy to 0.01 fibers/cc, shall be collected. (See Section X, Cleanup and Area Clearance).

4. All air monitoring results shall be maintained at the job site for inspection.

XII. Medical and Training Requirements

Medical monitoring (and recordkeeping) as required by OSHA regulations shall be provided to all workers. In addition the contractor shall maintain at the job site written documentation indicating that each employee has had instruction on the hazards of asbestos exposure, on the use and fitting of respirators and on all aspects of work procedures and protective measures involved in the abatement operation.

No. 1390